Index bound in Vol. 21

Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Vol. XX [In Two Sections] APRIL 9, 1930 [Section 2] No. 1

3802

Section 2 and Index

PIT & QUARRY Vol. 20 Apr. 8 June 18 - 1930 Green. Bind covers and adv. one no. only

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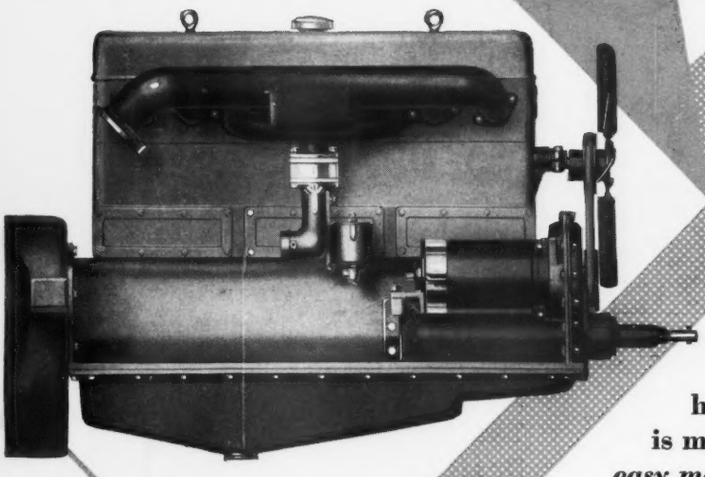

Next to abundant power the user of heavy-duty equipment is most vitally interested in *easy maintenance.*

Wisconsin engines tally high on both counts. They not only deliver "more power per cubic inch", but require less servicing per thousand hours of operation . . . Easy, low cost maintenance is one of the results of Wisconsin over-size construction . . . and the infinite care and accuracy with which these dependable engines are built. The value of this, of course, is obvious . . . to builder and user, alike.

Built in a full range of Sixes and Fours, from 20 to 150 H. P., for industrial machinery, trucks and tractors.

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MORE POWER per CUBIC INCH

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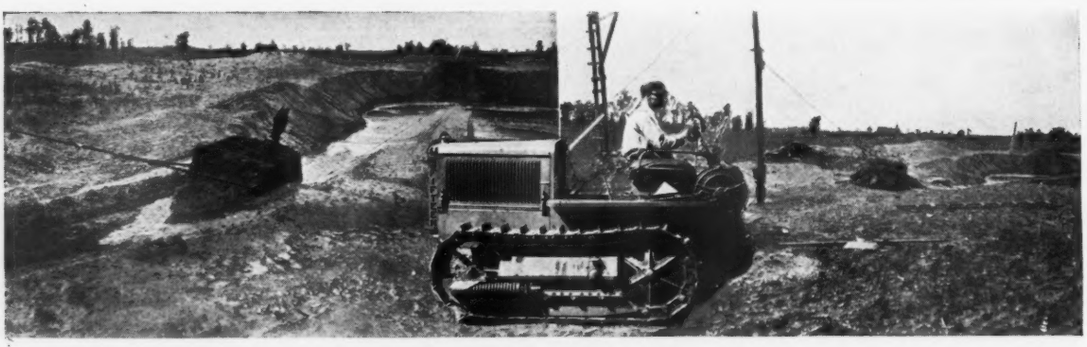
TRADE MARK REGISTERED
FOR ANY LIFT OR PULL



A HYSTER-equipped tractor gets about quickly, has plenty of power, makes hard jobs easy

The increasing demand for sand and gravel offers real opportunity for ambitious men in every community, in the operation of small sand and gravel plants.

For small or large pits the Hyster equipped tractor offers many distinct advantages over other hoisting machines. A complete, compact unit, it moves itself to the pit where it can be put into operation quickly. To shift from one pit to another or from one setting to another at the same pit is only a matter of a few hours' time. Contractors, pit owners and highway commissioners everywhere find the Hyster dragline outfit the most practical and economical equipment available for the purpose.

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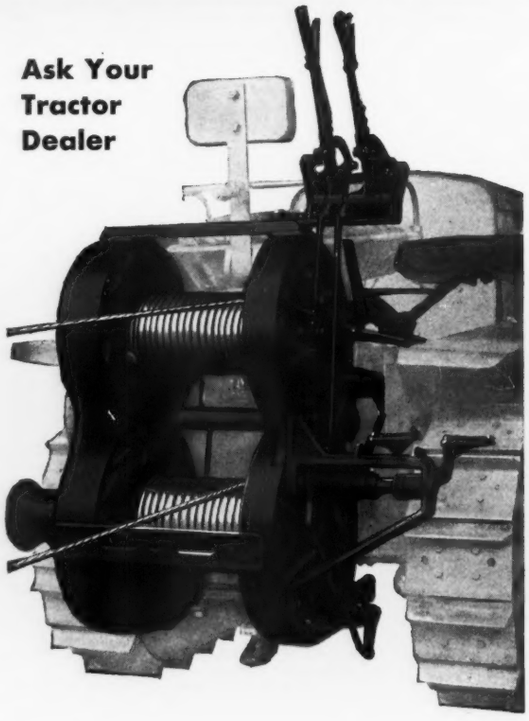

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Address_____ Business _____

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Of course your rock is TOUGH DIGGING

— BUT THIS MACHINE IS BUILT FOR IT!

Rock — the toughest rock that ever came out of a quarry — is no problem for Bucyrus-Erie full-revolving quarry and mining shovels.

No worries about your daily output—no forcing of your machine to make a good day's showing — no sleepless nights over breakdowns when you dig rock with a Bucyrus-Erie.

For big output — for dependability — you can't compare these rugged quarry machines with general work shovels. When you study one at work you'll see why they have revolutionized loading costs. Let us send you a bulletin.

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A-77—4-9-30-PQ

Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Published Biweekly on Wednesday for Producers and Manufacturers of Sand, Gravel, Stone, Cement, Gypsum, Lime, and Other Non-Metallic Minerals.

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NO TIPPING
NO ROCKING
EASILY OILED and GREASED
BOOM DIRECTLY over Roller Path
MEANS MORE YARDAGE

—and more yardage means

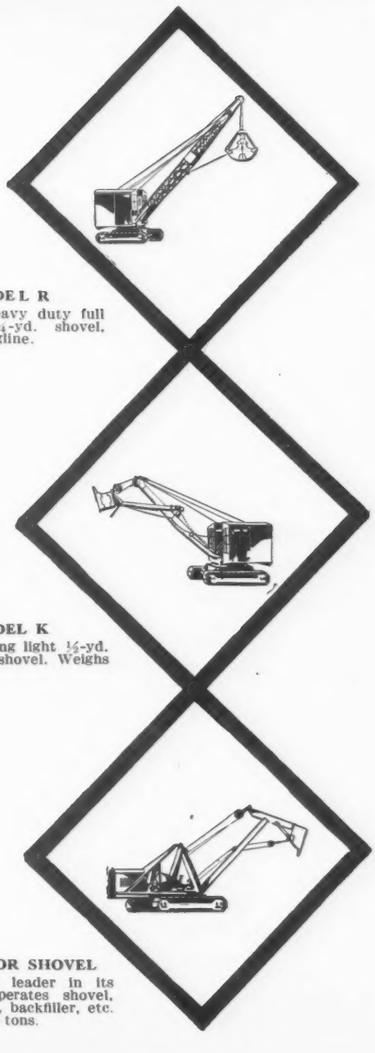
LONGER PROFITS

EXCESSIVE profits are strangers to the contractor in these days of close bidding, but you can make *longer profits* through *greater yardage* by putting the BAY-CITY Model K to work.

Model K is a light ½-yard full revolving shovel, convertible to crane, dragline, skimmer and trench hoe. Short tailswing permits working in close quarters. Independent friction clutches on each separate crawler makes it possible to turn around in minimum space.

The 8-in. center pin and the 6-foot roller path, equaling or exceeding similar parts on one yard machines, plus the mounting of the base of the boom less than 30-in. from the center pin, reduces rocking or tipping to an absolute minimum and mechanically balances the machine. This also enables the Model K to handle the same size buckets and same length booms that are used on machines three to five tons heavier—meaning economy and greater yardage with the flexibility and efficiency of a light ½-yard machine.

Investigate the Model K . . . Write us for further information or the name of our nearest distributor.



MODEL R
A 26-ton, heavy duty full revolving ¾-yd. shovel, crane or dragline.

MODEL K
Full revolving light ½-yd. convertible shovel. Weighs 14½ tons.

TRACTOR SHOVEL
Recognized leader in its field. Operates shovel, trench hoe, backfiller, etc. Weights 10 tons.

BAY CITY SHOVELS, Inc.
New York Office—302 Broadway BAY CITY, MICH.

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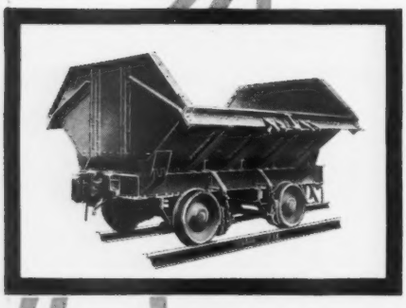
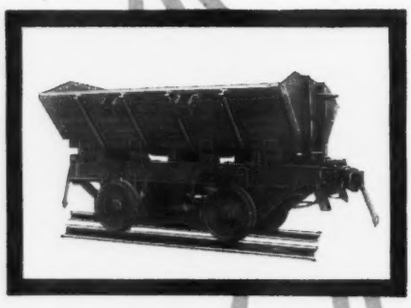
THE BAY CITY FAMILY OF FAST WORKERS

KOPPEL CARS

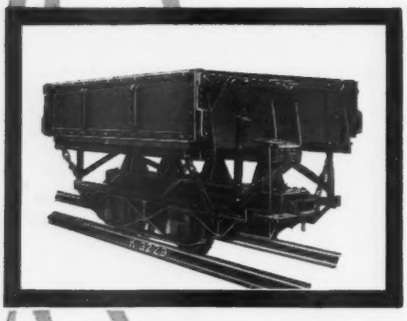
best for all purposes

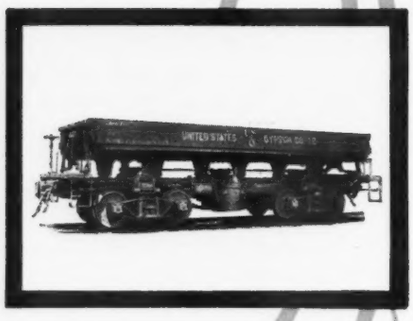




These six illustrations, representing equipment ranging from 2 cubic yards to 16 cubic yards capacity, are a few of the many types and designs built by this Company which have given satisfactory service in many quarries.

Our designs are not limited by size of equipment required for economical operations; they vary from 1 cubic yard capacity to 35 cubic yards capacity, the larger capacity designs being of the Koppel Air Dump Car type which are now being used in the largest American Limestone Quarries.





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Koppel, Penna.

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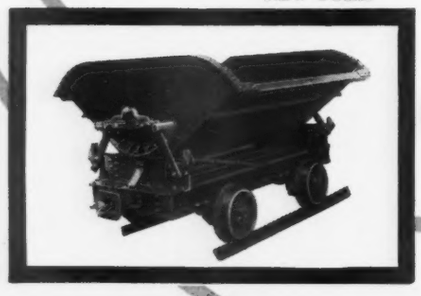

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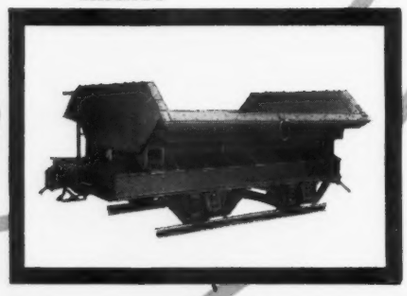
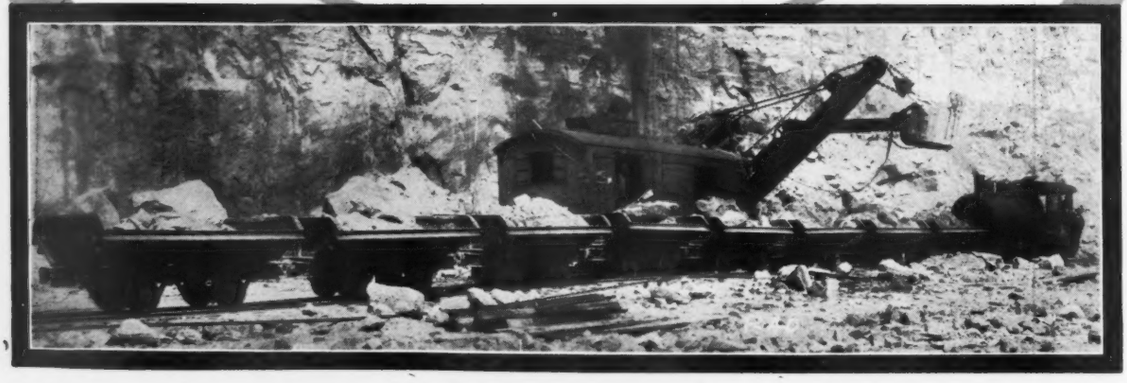
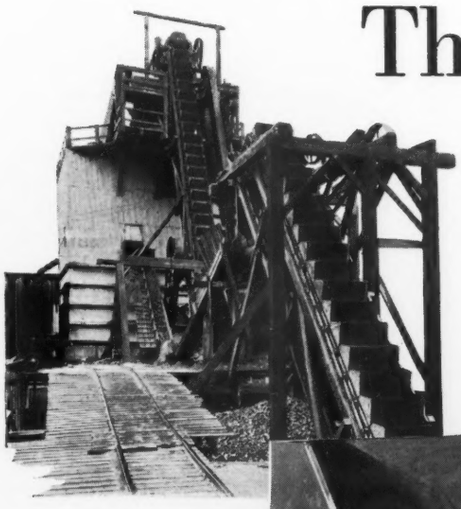


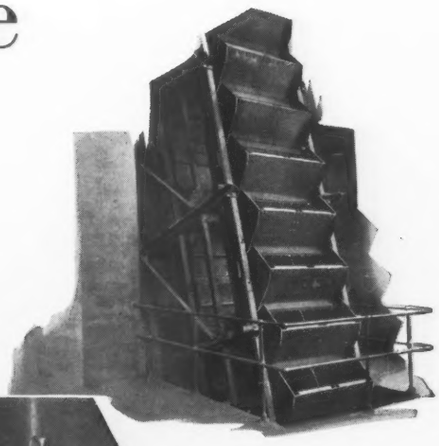


Elevator Buckets That Hold Their Shape



Jeffrey Heavy Duty Elevator serving a Stone Quarry.

Style D Heavy Steel Bucket for continuous bucket type elevators handling large capacities of crushed stone, sand, gravel, etc.

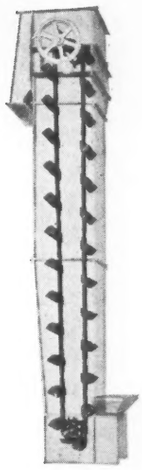


Jeffrey Super-Capacity Elevator handling stone in a Cement Plant. These stone elevators have a capacity range of 300 to 750 tons per hour.

THE heavier elevating requirements of cement, Lime, Gypsum and Stone Plants call for elevators whose buckets will stand the strain of heavy loads, and falling blows from large size stone.

Super strength and stiffness are built into the buckets used on Jeffrey Heavy Duty and Super-Capacity Elevators. These buckets are constructed of ¼-inch steel plate throughout . . . . a stiffening angle on back prevents buckling . . . . another angle protects lip of bucket from the battering action of loaded crushed stone . . . . and all parts of buckets are securely riveted together. In the larger sizes, a center diaphragm riveted to front and back, guards against sagging.

Besides Jeffrey Super-Capacity and Heavy Duty Elevators, there are the Intermittent type Elevators with malleable or steel buckets for lighter capacities in handling cement, lime, gypsum, sand, gravel, stone, etc. Catalog No. 465-M gives complete specifications, capacities, etc., of both types. If you are interested in better elevators, we will be glad to send you a copy without obligation.



Jeffrey Bucket Elevators with intermittently spaced buckets are adapted to moderate handling capacity and can be furnished with or without steel casing. Both continuous and intermittent type of elevators can be made for either vertical or inclined operation.

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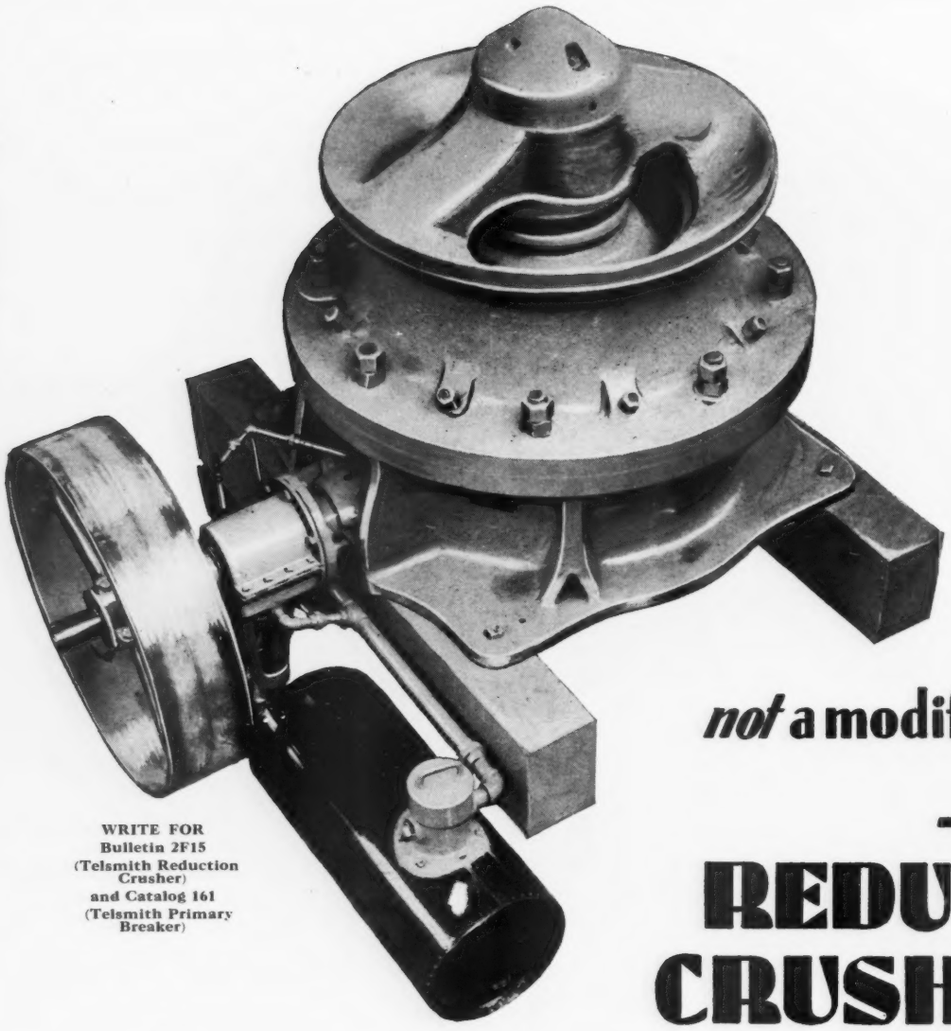
JEFFREY

MATERIAL HANDLING EQUIPMENT

Jeffrey Products

Elevators
Conveyors
Trolley Conveyors
Portable Loaders
Coal and Ashes Handling Equipment
Skip Hoists
Chains and Attachments
Sprocket Wheels—Gears
Crushers—Pulverizers
Sand and Gravel Handling, Washing and Screening Equipment
Locomotives
Mine Equipment
Ventilation Fans



WRITE FOR
Bulletin 2F15
(Telsmith Reduction Crusher)
and Catalog 161
(Telsmith Primary Breaker)

not a modified breaker

—a Real

REDUCTION CRUSHER

OTHER crushers are flared outward at the top to increase the feed area . . . but Telsmith is different. The shape of Telsmith's crushing cone makes it a *real* reduction crusher. Telsmith's umbrella-shaped head and concaves *flare outward at the bottom to increase the discharge diameter.*

Close adjustment is possible because the circumference of Telsmith's discharge circle is so enormously increased that the bowl always clears freely. That's why Telsmith actually works best with a choke, unregulated, gravity feed. Pile the rock on . . . twenty feet high if you want to . . . so long as it's clean, dry and free from fines, *Telsmith will never clog.*

Short steel structure and short, fixed shaft . . . both guaranteed against breakage, by tramp iron . . . make Telsmith the world's strongest, most reliable secondary crusher.

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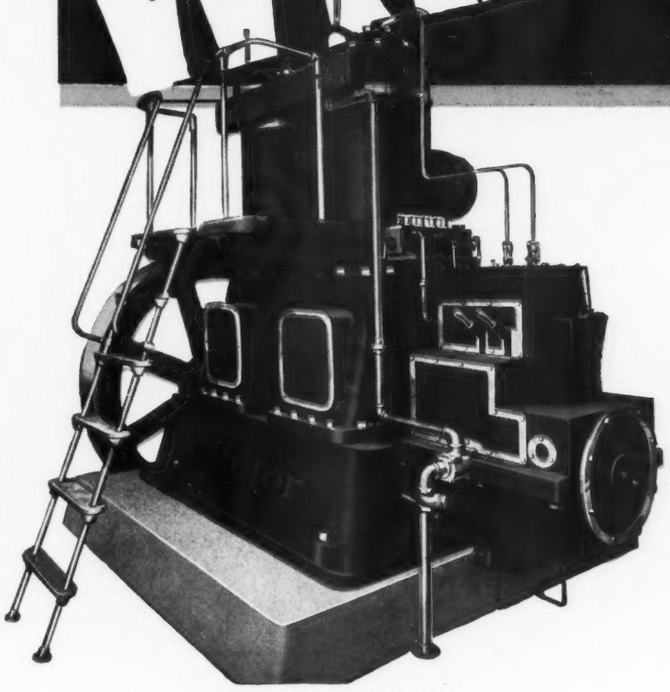
SMITH ENGINEERING WORKS, 88 Capitol Drive, Milwaukee, Wis.

TELSMITH

R-5

Which Victor WILL BEST MEET YOUR POWER NEEDS?



VICTOR VERTICAL
DIESEL TYPE ENGINE

Your plant conditions may require the Horizontal type of engine or you may prefer the Vertical, in either case there is a VICTOR DIESEL TYPE PRIME MOVER that will meet your needs. Every Industry using power in any form can afford the VICTOR because of the economies it effects—it will pay its first cost within a very short period. VICTOR saves labor, saves space, saves ash-handling, uses little fuel and lubricating oil. Time-tried — we have been building Diesel Type Engines for more than 27 years and have placed more than 3,000 in service in every kind of industry. Built for long, hard, exacting service by a concern who has specialized in the production of precision machinery for two generations—the Power Manufacturing Company is a subsidiary of The Osgood Company who operate five large plants and whose product is used in every civilized country. If you have a power problem, the VICTOR is the solution. Let us tell you more about it.

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Subsidiary of The Osgood Company
MARION, OHIO

BOTH EFFICIENT!

BOTH ECONOMICAL!!

BOTH PRACTICAL!!!

BOTH ARE THE RESULT OF 27 YEARS CONTINUOUS EXPERIENCE IN THE DESIGN, MANUFACTURE AND OPERATION OF DIESEL TYPE ENGINES.

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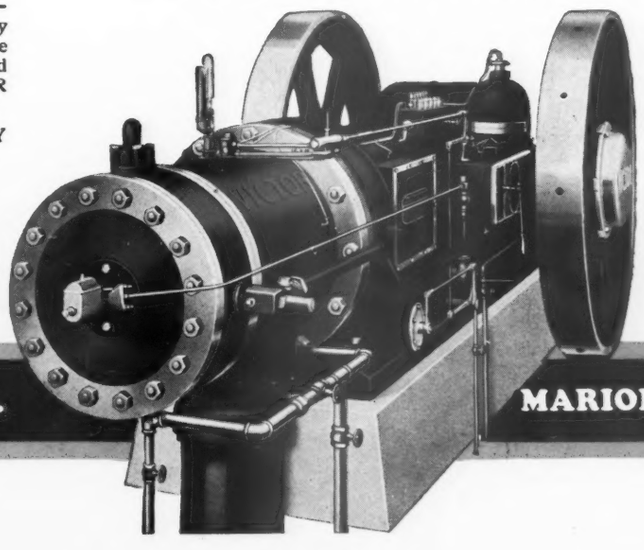
IN SERVICE IN EVERY KIND OF INDUSTRY.



VICTOR HORIZONTAL
DIESEL TYPE ENGINE

THE POWER MFG. CO. MARION, O.

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1930 PIT and QUARRY HANDBOOK and DIRECTORY

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The technical and semi-technical treatises answer practically every question that arises in the location, design, equipment and operation of pits, quarries, mills, etc.,—describing also the most modern methods and machinery in detail. Most of this information is original and nowhere else in print—so complete and authentic as to command respect and usage by every operator, large or small. Arranged in a manner to produce facts and data instantly, without wading through a mass of other matter to obtain them. An index at the beginning of each section further facilitates reference.

Operator's Buying Guide

Descriptive advertisements of machinery and supplies involved in operations discussed in each technical section are interleaved. Instant reference to these advertisements is made timely by their positions and easy by any of the three indices in the back of the book.

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Alphabetical and geographical lists of producers of non-metallic minerals throughout the United States, giving all important information regarding their product, type of operation, annual capacity, and names of executives, will be contained in the Directory section.

Price

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Orders will be filled in the order in which they are received, and we respectfully urge you to send yours in NOW. Remember, you pay nothing until you receive your HANDBOOK.

Complete Service Publishing Co.

538 S. Clark Street **Chicago, Ill.**

ALL BEARINGS--- and even drums---from 36" boom point sheave to the conical rollers on the rotating path are Timken equipped --- an absolute minimum of friction losses. (You can actually swing the shovel from the ground by hand.)

LIMA "101"

90% OF ALL CASTINGS used in the Lima "101" are *steel* - - several tons more than are used on any other shovel of similar *rated capacity.* Quality inbuilt to insure long, uninterrupted service.

UPPER ROTATING FRAME CASTING is a one-piece, heat treated alloy steel casting with main machinery supports cast integral—not a single bolt or rivet to work loose —insuring perfect alignment of all bearings and gears.

FULL FLOATING DRIVE SHAFT—relieved of all bearing pressure from the shovel by five hammered alloy steel, heat treated axles — permits of steering, by wheel from operator's seat in the cab, a radius in twice the width of the crawler trucks or in a wide radius.

ALL STEEL, TRUSS reinforced BOOM and all steel, inside type dipper handle. Nothing to rot or warp and the ideal type of construction for heavy duty. All steel boom and handle construction is used on most of the larger heavy duty shovels.

Features that mean greater profits.

Since the first day that LIMA "101" stepped into the field as a finished standardized gasoline shovel, dragline, crane and dragshovel, it has been outperforming all other 1 yard and 1¼ yard shovels on the market. Its power, speed and dependability have attracted the attention of the whole excavating industry. No other excavator of the same capacity has so many new and practical features—features that insure longer life, greater profits, and ease of operation.

A copy of Bulletin 301 which illustrates and describes the LIMA "101" in detail will be sent on request'

SINGLE LINE HOIST for super speed and super-power. No extra, small diameter sheaves to flex and wear out cable — not even a bail to interfere with hoisting above the boom.

EXCLUSIVE, INDEPENDENT DIFFERENTIAL CROWD permits of fast, cushioned shaking of the dipper. Powerful enough to crowd out loaded dipper to last tooth in racking with ease — and positive enough to hold it there indefinitely.

The Ohio Power Shovel Co.

Division of Lima Locomotive Works Incorporated

Lima, Ohio

Western Office
846 Straus Bldg.,
Chicago

Eastern Office
2351 Graybar Bldg.,
New York

LIMA "101"

PUT IT ON ONE END

A simple material-moving idea that is earning thousands of dollars for big and little sand and gravel plants all over the country

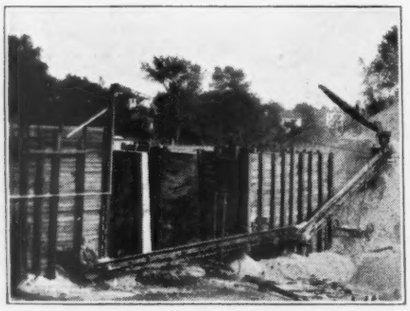
Each Barber-Greene Conveyor Belt is a broad, swiftly moving highway that carries your sand or gravel from where you have it to where you want it.

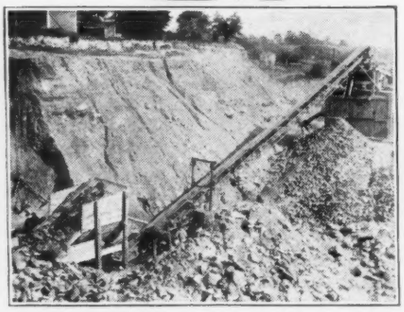
Carries up to and beyond 300 lineal feet, and elevation angles up to 35 degrees are not uncommon.

You simply put the stuff on one end and watch it come off the other.

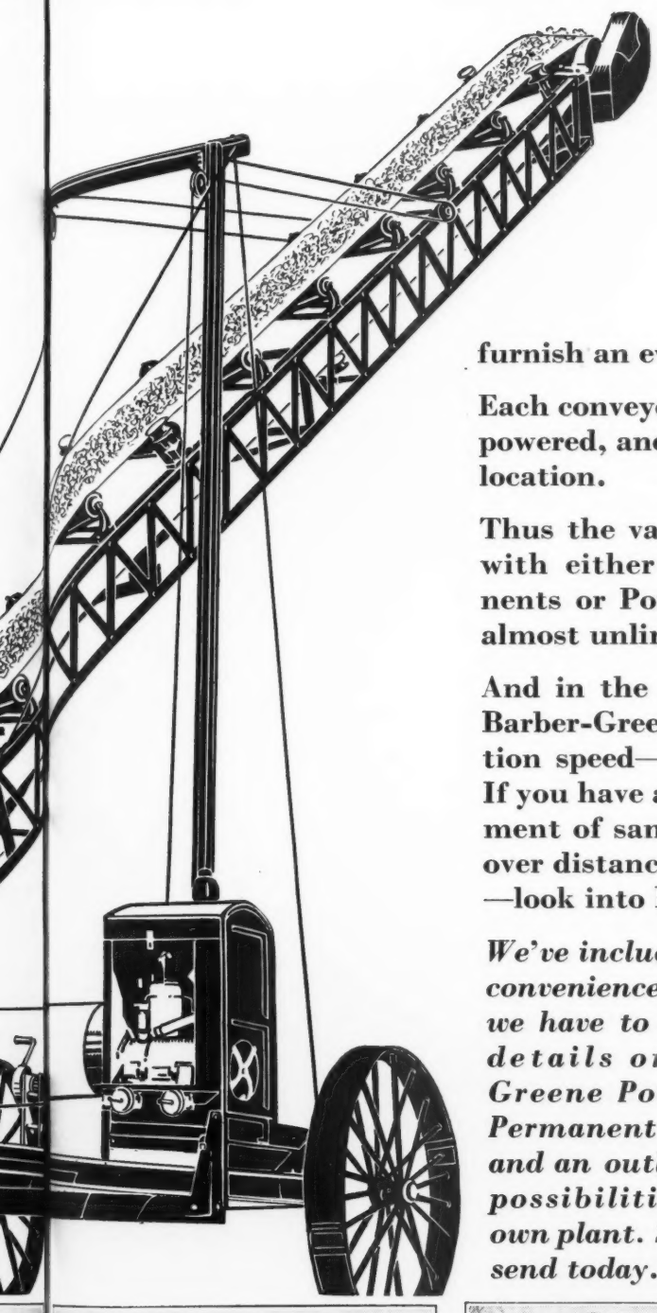
Each Barber-Greene Conveyor is built up of standardized Warren Truss Sections. Permanent or semi-permanent conveyors can be easily installed or rearranged to meet any conditions.

And Barber-Greene Portables, available in lengths from 15 to 60 feet,





BARBER B STANDARDIZED MATERIAL HANDLING MACHINES G **GR**



WATCH IT COME OFF THE OTHER

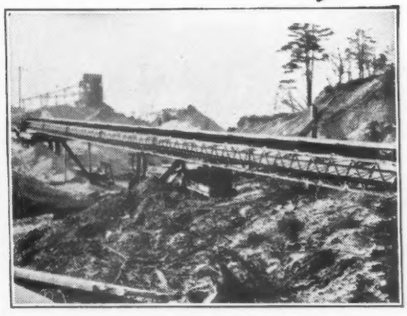
furnish an even more flexible Set-up.

Each conveyor is self-contained, self-powered, and readily moved to a new location.

Thus the variety of possible layouts with either Barber-Greene Permanents or Portables in the big pit is almost unlimited.

And in the smaller pits one or two Barber-Greenes provide big production speed—at a relatively low cost. If you have a job involving the movement of sand or gravel or strippings over distances of from 15 feet on up —look into Barber-Greenes.

We've included this coupon for your convenience, to help you check what we have to offer. It brings you the details on Barber-Greene Portable and Permanent Conveyors and an outline of their possibilities in your own plant. So fill in and send today.



REENE

BARBER-GREENE COMPANY, 492 West Park Avenue, Aurora, Illinois
Send me a copy of "*New Applications and Set-ups.*"

Name.....

Address.....

City..... State.....

200-225 H.P.
8 CYLINDERS

New Smoothness
New Sweetness
New Flexibility

with all the efficiency of Blue Streak Combustion

Tremendous power, conservatively rated at 200 h. p., at 1,000 r.p.m., with Blue Streak smoothness, Blue Streak fuel savings, and Blue Streak flexibility, is the story told by this newest Climax Development.

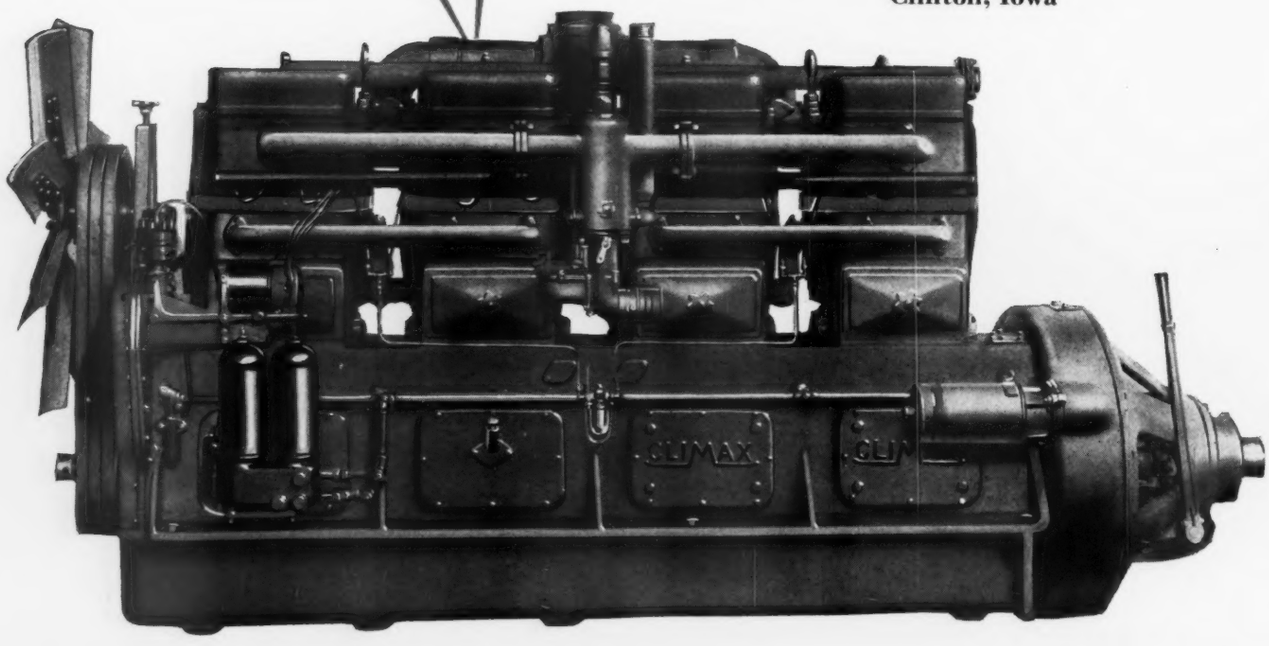
For you get the inherent power of 8-in-line, 6"x7" cylinders, plus the efficient combustion that only Blue Streak design can give.

This remarkable combustion, developed by Climax Heavy Duty Engines alone, is produced by radically advanced head, manifold and overhead valve design. It makes each fuel drop give all it's got.

Result: 10 to 12% more power with about 10% less fuel than the average engine of equal piston displacement — torque characteristics closely similar to steam—and no "ping" or stalling on heavy loads at low speeds.

CLIMAX Trade-Mark Reg. U. S. Pat. Off.

CLIMAX ENGINEERING COMPANY
82 West 18th Avenue
Clinton, Iowa

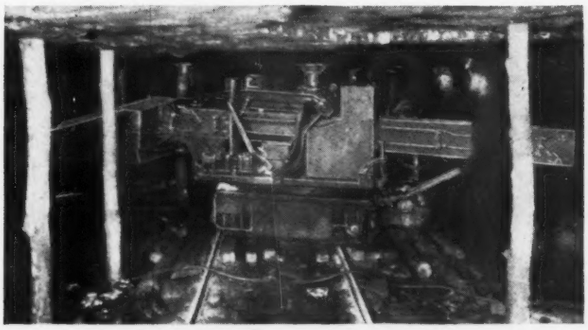


Mine Operators—

Lime—Cement—Gypsum—
Clay—Ore—Salt—or Coal

The GOODMAN POWER SHOVEL loads cars at the face!

Loaded Scoop Swinging Over Car



Crossing Room Track to Reach New Face

Loading Out Many Tons of Salt at One Setting

Loading Cars at a Considerable Distance

Ore Ejected from Scoop to Car

Lifting a Scoopful of Coal through the Pile

Tonnages per Man Are Doubled!

Labor Loading Costs Are Cut in Half!

The thorough mine inspection always made before a Power Shovel is installed is a big reason for the universal success of this loader. No expense to you—no obligation, of course.

Investigate—it may pay you!

Ask for Book 270-A—Free upon Request

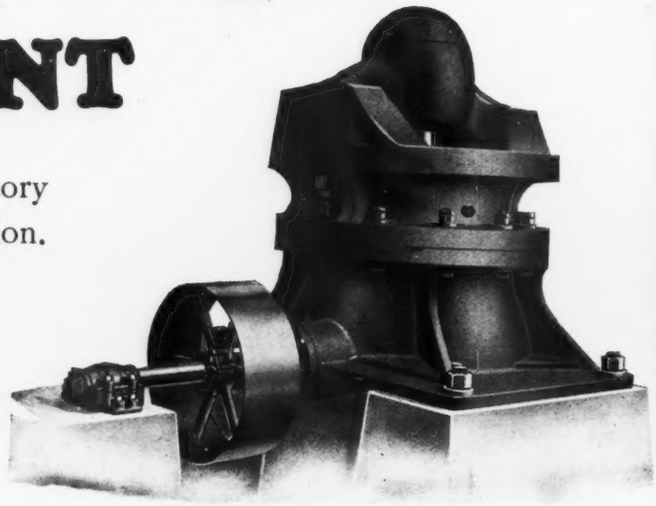
BUILDERS OF LOADING MACHINES FOR 17 YEARS

GOODMAN MANUFACTURING COMPANY HALSTED ST. at 48TH CHICAGO---ILL. LOADERS AND LOCOMOTIVES

(25)

- - and in England's SUPER-PLANT

A Traylor Bulldog Finishing Gyratory Crusher is giving great satisfaction.



Waterlip Quarry, of the Mendip Mountain Quarries Company, near Cranmore, Somerset, England, completed a modern crushing plant in 1927 that is a monument to British enterprise and skill. With a maximum capacity of about 10,000 tons of crushed limestone rock per week, this super-plant is probably the largest and most modern in England.

The 6-in. Traylor Finishing Crusher reduces the limestone from 2½ in. and 1 in. sizes to ¾ in. or ½ in. and under.

Operators every where have found Traylor Bulldog Finishing Gyratory Crushers particularly adapted for the production of small sizes—for use after the initial or secondary breaker—or as auxiliaries, tapping feed from the storage bins of larger sizes. For high tonnage, dependable operation and low power costs this crusher has no equal.

Some Users of

Bulldog Finishing Gyratory Crushers

4½ Inch

1 Hawaiian Contracting Co.	Honolulu, Hawaii
1 Arizona Sand & Rock Co.	Phoenix, Ariz.
1 Castle-Tretheway Mines, Ltd.	Elk Lake, Ont., Can.
1 Vermont Asbestos Corp.	Hyde Park, Vt.

6 Inch

1 Oregon Sand & Gravel Co.	Oregon City, Ore.
2 Hecla Mining Co.	Burke, Idaho
2 Independence Sand & Gravel Co.	Independence, Ore.
1 Belmont Gurnee Stone Co.	West Nyack, N. Y.
1 Fanwood Stone Crush. & Quarry Co.	Plainfield, N. J.
2 Patino Mines & Ent. Cons.	Para, Bolivia
1 Colonial Sand & Stone Co., Inc.	Little Neck, L. I., N. Y.

10 Inch

1 Cons. Mng. & Smelt. Co. of Can.	McDougall, B. C., Can.
1 Great Lakes Gravel Co.	Detroit, Mich.
2 Dominion Trap Rock Co., Ltd.	Bruce, Ont.
1 Henry Steers, Inc.	Jersey City, N. J.

15 Inch

1 Beachville White Lime Co., Ltd.	Beachville, Ont., Can.
1 General Crushed Stone Co.	Glen Mills, Pa.

20 Inch

1 Pickands Mather & Company.	Negaunee, Mich.
1 Palmer Mining Company.	Palmer, Mich.
1 New York Trap Rock Co.	Verplank, N. Y.

If you would like the whole story, just say where and when we shall send our man!—and be sure to send for Bulletin 2109!

TRAYLOR ENGINEERING & MANUFACTURING CO.
ALLENTOWN, PENNSYLVANIA, U.S.A.

New York City, 30 Church St. · Chicago, 1414 Fisher Bldg. · Los Angeles, 908-909 Chester Williams Bldg. · Seattle, 815 Alaska Bldg. · Salt Lake City, 101 W. 2nd So. St.

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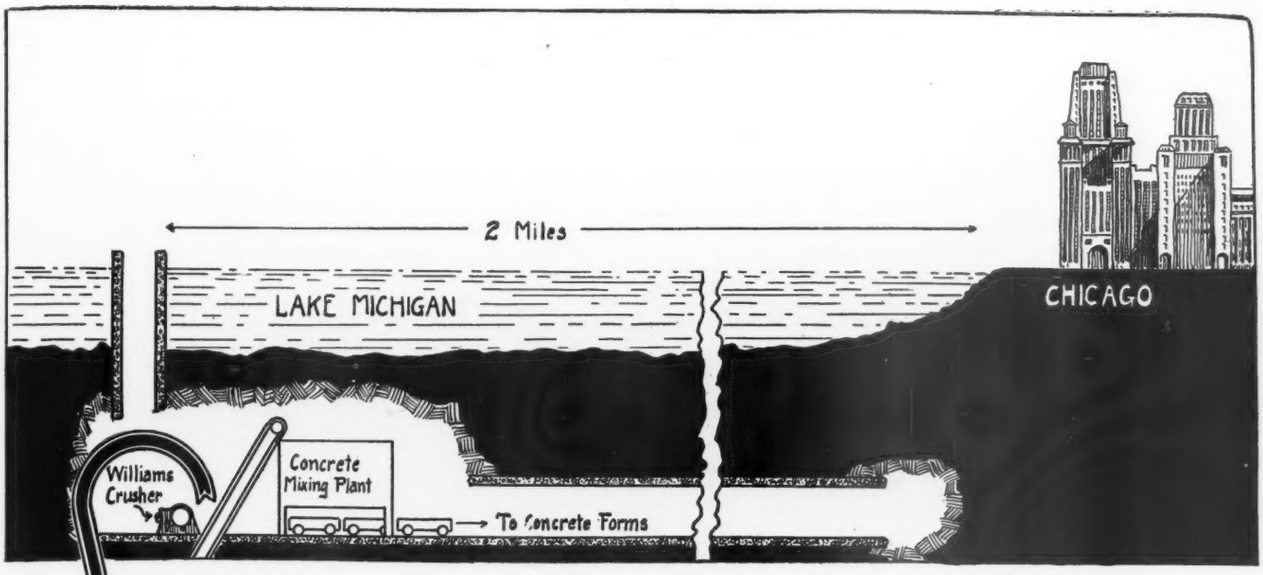
EXPORT DEPARTMENT—104 PEARL STREET, NEW YORK CITY

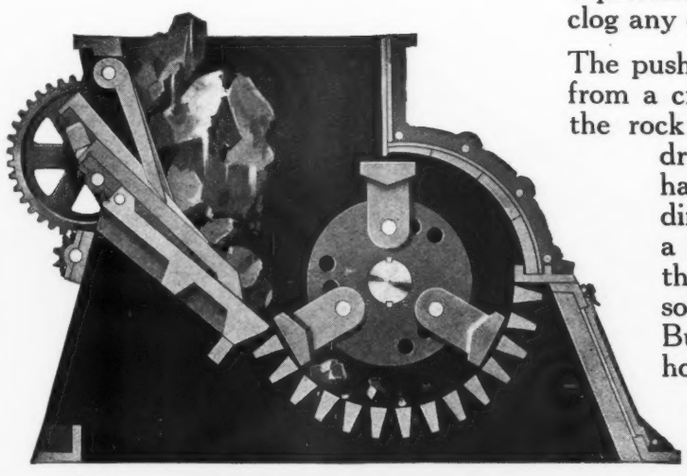
Foreign Sales Agencies: London, Rangoon, Sydney, Melbourne, Johannesburg, Lima, Sao Paulo, Rio de Janeiro, Buenos Aires, Santiago, Valparaiso, Antofagasta, Iquique, Ururo
European Works—Usines Carels Freres, Ghent, Belgium



Crushing Wet, Mucky Rock in Chicago's future water supply tunnel

Two miles out in Lake Michigan and 220 feet down, the city of Chicago operates a Williams "Pusher" type Hammer Crusher. Its job is to take the wet, mucky rock, 75 tons per hour, containing about all the water it will hold, as shot out of the new 16 feet diameter water intake tunnel and convert it into 1½-inch concrete stone for relining the long tube.

Here again the "Pusher" type is giving ample evidence of its superiority in handling wet, sticky stone which would clog any other crusher.



The pusher action is positive. Two rams operated from a crank shaft work back and forth and push the rock into the path of the hammers. It's all driven from the main crusher shaft and will handle clay, shale, soft limestone and similar difficult material. Cement plants which crush a percentage of their overburden along with their stone are finding in the Pusher, the solution of a formerly difficult problem. Built in capacities from 50 to 300 tons per hour. Get our recommendations on your work.

WILLIAMS PATENT CRUSHER & PULVERIZER CO.
802 ST. LOUIS AVE., ST. LOUIS, MO.

Chicago 37 W. Van Buren St. | New York 15 Park Row | San Francisco 337 Rialto Bldg

THE WILLIAMS PATENT CRUSHER & PULVERIZER CO. ST. LOUIS, MO. U.S.A. TRADE MARK
REG U.S. PAT OFF

Williams

OLDEST AND LARGEST BUILDERS OF HAMMERMILLS IN THE WORLD

Williams

PATENT CRUSHERS GRINDERS SHREDDERS

This Firm Wanted a Man

"Note in your employment department you state that you are willing to place your subscribers in touch with certain applicants who are wanting jobs.

"Writer has recently engaged in the crushed stone and agricultural lime manufacturing business here. Have a very nice quarry and outfit, capacity of 100 to 250 tons per day. I need a practical foreman who is able to look after the entire operation, except the office and selling end."

Very truly yours,
E. M. Bassett,
BASSETT PRODUCTS CO.

This Man Wanted a Job

"I have been employed by the Bassett Hardwood Manufacturing Company here and thank you for your assistance.

"Your employment service is as good as it is unique. I know of no other like it."

Yours truly,
BEN SHAFFORD.

PIT & QUARRY DID THE REST!

CAN YOU USE THESE MEN ?

The PIT AND QUARRY Employment Service for subscribers has registered the following applicants for positions. Perhaps you have an opening in your organization for one of these men. If so, PIT AND QUARRY will be pleased to put you in touch with the applicant if you will advise us which one fills your requirements.

1-A. 12 years' experience Highway construction and sand and gravel. Can design and install own pits. Ready-Mix concrete. Have operated Central Mixing plants.

4. Quarry superintendent; 10 years' experience.

5. Chief engineer cement plant; 10 years' experience; desires connection with engineering or manufacturing firm, either in the office or in the field.

9. Quarry foreman, 6 years' experience.

10. Superintendent; 10 years' experience; lime and stone.

11. Superintendent crushed stone; 25 years' experience.

12. 10 years' experience in production of crushed gravel and sand; design engineer and builder; general superintendent; has had some sales experience. Experience covers the entire field.

14. Thoroughly experienced superintendent who has also in the past been assistant superintendent and foreman of granite and lime quarries; at present not employed.

15. Experienced superintendent or manager; graduate engineer; 12 years' experience in sand and gravel production and plant design.

16. Superintendent, 30 yrs. experience, mine, mill and quarry and large shovel operations, thorough knowledge of various systems of underground and open pit mining. Development work from grass roots to mill construction and operation, copper, iron, zinc and non-metallics, 4 yrs. special work in asbestos, mica and kaolin, good organizer and good production and safety record but not a college graduate. South, Southwest or Tropics preferred.

18. Superintendent of stone crushing and sand and gravel plant with considerable experience in operation of dredges, draglines, electric and steam shovels, all kinds of crushing, conveying, screening equipment. Can furnish excellent references, good record and details of past experience.

19. Electric Shovel Operator with considerable experience. Also power-house and general electrician, maintenance, welding, repairing gasoline truck motors, crushers, screens and various kinds of equipment.

20. Crushed stone superintendent since 1903; prefer West or Southwest territory; thoroughly experienced in construction and operation of plants, know how to get best results from the quarry end.

21. Cement plant superintendent or heavy limestone quarry; 20 years' experience in construction and operating plants.

22. In the capacity of plant and quarry superintendent 12 years. Prefer Oklahoma or Texas, or some Southern locality.

23. Superintendent, thoroughly experienced in operation of sand and gravel and crushed stone plants.

24. Superintendent, stone quarry or slag plant, 16 years office and operating experience.

25. Dragline, Crane and Shovel Operator, 9 years experience in steam and 3 years on electric shovel (Marion), desires position as operator. Can do own repairing. Permanent connection desired. Married. References furnished. Will go anywhere, but a location near good schools preferred.

26. Operator with 5 years' experience on Link-Belt and Koehring cranes. Also 7 years' experience in sand and gravel pit. Available now. Go anywhere.

27. Laboratory work, 3 years' experience as Asst. Chemist doing control and analytical work. College graduate, B. S. degree.

28. 12 years' experience as cement burner and night foreman and watchman.

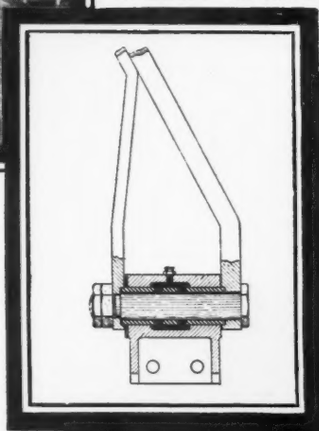
EMPLOYMENT DEPARTMENT
PIT AND QUARRY
538 South Clark Street Chicago, Illinois

WHY AN OWEN COSTS LESS TO OPERATE

CAREFUL design and construction that omits no detail, insures continuous economical operation and lasting uninterrupted service for Owen Buckets. All wear is eliminated from castings, bars and plates. Heat-treated pins and shafts turn in bushings made of thoroughly tested metals. Alemite lubrication is used throughout, with grease reservoirs at necessary locations. Lips and teeth are of strong, high carbon and wear-resistant alloy steels. Cable is protected from chafing by 4 hardened steel rollers. Rapid reaving is obtained with holding and closing line sockets—without the use of cable clips. And, all parts of an Owen bucket are *guaranteed against breakage.* Write for "17 Points of Leadership."

THE OWEN BUCKET CO.

6017 Breakwater Ave., Cleveland, O.



17 POINTS OF LEADERSHIP

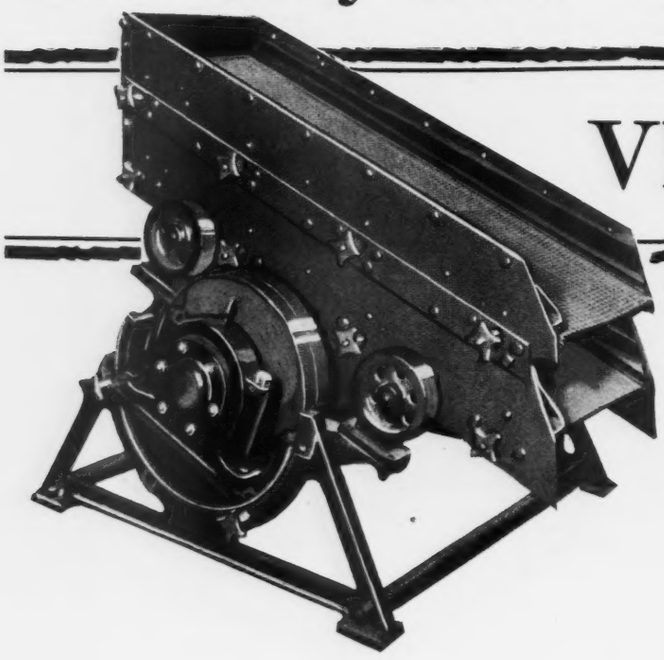
1. One-piece steel crosshead.
2. No wear in upper or lower arm ends.
3. Heavy high carbon steel arms.
4. Adjustable undiminished closing power.
5. Long life to sheaves and cable.
6. **Long arm bolt bearings sealed from grit.**
7. Lever type steel arm brackets.
8. **Closing cable is protected against excessive wear.**
9. Heavy shock-resisting renewable lips.
10. **Cable clips eliminated.**
11. Sealed center shaft bearings.
12. Greater digging power with no dead weight.
13. Penetration and clean dumping.
14. Dropping shocks absorbed, eliminating breakage.
15. Rigid shell construction.
16. **Heavy duty, high carbon drop-forged steel teeth.**
17. Lips or teeth points hit first.

OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAY'S WORK

Owen Buckets

The Only Real Adjustable

VIBRATION



The JIGGER is a circle-throw Vibrating Screen with either up or down-hill action that positively *will not clog.*

Eight years' extended research has produced a revelation in adjustable vibration, in flexibility and screening efficiency. In The JIGGER it is only necessary to change the relative positions of both the eccentric shaft and tube to obtain the proper circle-throw action. By this simple patented feature any one of "1000 variations" can be selected to secure efficient grading. Vibration is positive at all times—regardless of load conditions.

The JIGGER Advantages

VERY LARGE CAPACITIES—Counterflow rotation pulls fines through immediately. Uniform action—no dead spots.

ACCURACY IN SIZING—Quick, easy tilting to desired angle—even while running. Adjustable vibration to suit the material. No migration—product always controlled.

COMPACTNESS—FAST CLOTH CHANGE
Screen cloth can be changed in 5 minutes. Screen occupies small floor space.

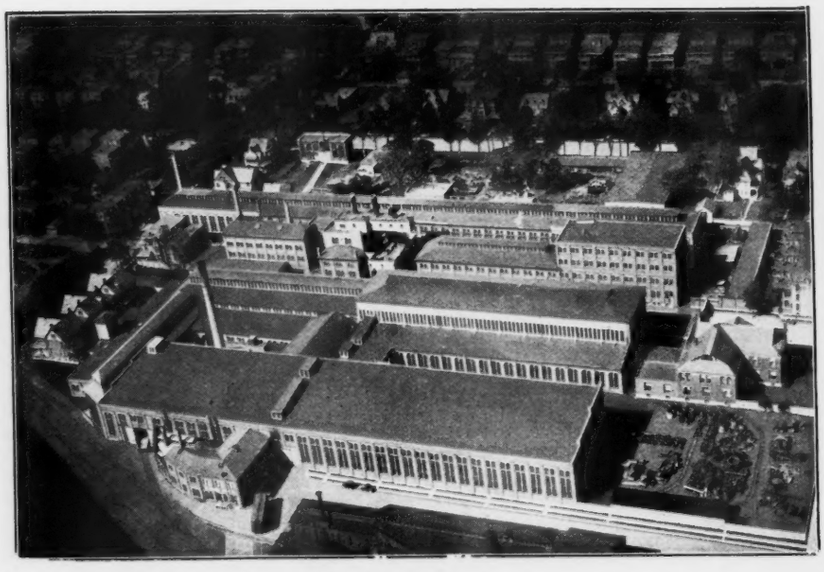
A HIT IN OHIO

The Builders Sand Co., of Cleveland, Ohio, says of The JIGGER: "... regarding performance of the No. 24 size 2' x 5' JIGGER Screen, installed at our Krumroy Plant last June, please be informed that this machine has given excellent satisfaction, better separation and more tonnage."

"Krumroy is located in water spring region which makes the sand wet about 95% of the time. This is not the only difficulty, as this product coming from the earth has a 25% loam or clay deposit, which makes it extremely difficult for production and proper separation. When the material is extremely wet, the instant speed and throw change of The JIGGER gives the desired results. *This is not true of other screen machines . . .*"

This letter is a typical experience of many leading plants that have installed JIGGERS. Standard sizes from 1' x 3' to 4' x 8'. Special sizes built to order. Let us send you complete information.

Where The JIGGER is Made



York, Penna.

PRODUCTIVE EQUIPMENT CORPORATION

7535 SOUTH CLAREMONT AVE., CHICAGO, ILL.

Representatives from Coast to Coast

Pit and Quarry
With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Vol. XX CHICAGO, APRIL 9, 1930 No. 1

Improved Format for Readers' Convenience

PRESENTS TIMELY NEWS FIRST

Conspicuous changes in make-up will be observed in this issue of PIT AND QUARRY. News, which has heretofore been segregated in a special department or scattered throughout the magazine, is now brought forward to the first reading pages, where it is given the prominence merited by its timeliness and importance.

Every week the non-metallic mineral industries give fresh evidence of their increasing activity, their continuous growth, and their changing policies and methods. New ideas, new discoveries, new mechanical processes and equipment, new problems in sales, administration, and production, new financial structures—these are typical of the rapidly changing viewpoints and ever-broadening knowledge characteristic of the present era in business. To record these changes is always the function of trade journalism, but, in these days of rapid progress in business experience and in the acquisition of technical knowledge, this function becomes a trade journal's highest duty.

In recognition of the increasing importance of such news PIT AND QUARRY has opened the front section of its reading pages to material of this kind, believing that matter of the greatest and widest interest should be given the most prominent position. Other improvements have been made at the same time. Type faces have been changed with the view of increasing the readability of the pages, minor alterations in make-up have been introduced to render small items more accessible, and in other respects the general arrangement of the contents has been revised to help the busy reader.

Hartman Acquires Two Crushed Stone Plants

Formation of the Kern River Rock Co., of Bakersfield, Cal., under the leadership of C. W. Hartman, prominent sand and gravel producer of Bakersfield, has followed the acquisition of two new crushed stone plants near that city.

One of the plants is situated on Cottonwood Creek and was formerly owned by Force, Currigan and McLeod. The other, a new plant, has just been constructed on the Kern River, and has started production with a daily capacity of 300 tons. With both plants in operation, a daily output of 500 to 600 tons is in prospect. The plants will serve construction projects in the southern San Joaquin valley.

Modern Tipple Increases Tennessee Plant Output

The Memphis Stone and Gravel Co. of Memphis, Tenn., is building a modern tipple at its Camden, Tenn., plant which will increase the daily output from about 40 carloads of gravel a day to approximately 75 carloads.

The concrete foundations have been started and about 75 men are working on the project.

Seattle Gypsum Plans Larger Plant Extension

G. O. Gray, president of Gypsum Products Corporation, Seattle, Wash., announces an expansion program that will require the expenditure of $150,000 for new machinery and building construction.

Farnam Chesire Lime Co. Acquired by U. S. Gypsum

Amalgamation of the Farnam Cheshire Lime Co. with the United States Gypsum Co. was recently announced. This adds two more modern lime plants to those already operated by the company. These are located at Farnams and Great Barrington, Mass. C. J. Curtin will continue in charge of the manufacturing and selling departments, becoming a part of the United States Gypsum Co. organization.

New Missouri Plant Goes into Production

GETS LONG STATE CONTRACT

The new sand and gravel plant of the Missouri Gravel Co., on a state tract near LaGrange, Mo., which has been in the course of construction for the last several months, began operation in March. The first material produced is being used in constructing the concrete floor of the Quincy Memorial bridge.

The company has secured a five-year contract to excavate gravel for the Missouri highway commission on the state tract which it occupies. The new plant cost approximately $100,000 and is said to be one of the largest and most modern producing units in Missouri.

The design and construction of the plant is a consolidation of the better methods in the industry for excavating, screening, washing and proportioning sand and gravel. The capacity of the new plant will be from sixty to seventy cars daily. The company will also operate its former plant in addition to the new tract on the state land. It is estimated that from 6,000 to 8,000 cars of sand and gravel will be shipped from the LaGrange plants during 1930.

Universal Atlas Repairs Storm-Damaged Harbor

Preparations for the impending opening of the shipping season are evident in the Buffington, Ind., harbor of the Universal Atlas Cement Co., where repair work on docks and vessels is under way.

Approximately 100 men have been engaged in clearing the debris and repairing the wreckage wrought by the Lake Michigan storms during the winter, when waves battered the dock wall and destroyed about 200 feet of track. This work is practically completed, officials of the company have announced.

Road-Building Plans for 1930 Set Record

STATES TO SPEND $1,601,000,000

Highway building activity in the United States will set a new record this year if plans reported to the U. S. Public Roads Bureau by state officials are carried to completion.

Co-operating with President Hoover in his plea for increased construction programs wherever practicable, the states and their counties plan expenditures for road and bridge building in 1930 to total $1,601,000,000. This is an increase of $250,000,000 over the sums spent for such purposes in 1929, and is $47,000,000 more than the outlay in 1928, which was the previous high mark.

This expansion of highway building activity, it is expected, will provide occupation for many thousands of additional workers as the season progresses, and aid materially in easing the unemployment situation.

The proposed expenditures as reported by state highway departments contemplate an outlay of $937,500,455 for construction and maintenance of state highways, and $663,500,000 for local bridges and roads.

A comparison of the highway budgets of the states in recent years is given in the following table:

1930	$1,601,000,000	1925	$1,241,000,000
1929	1,350,000,000	1924	1,181,000,000
1928	1,554,000,000	1923	979,000,000
1927	1,419,000,000	1922	898,000,000
1926	1,277,000,000	1921	1,034,000,000

Hollywood Material Firm Purchases Two Plants

The Securities Materials Co., of Hollywood, Cal., has purchased two established plants in the San Fernando valley having a combined capacity of 100,000 tons of sand, gravel and crushed rock per month, according to the *Hollywood News*. The Kellerman plant on Big Tujunga wash produces crushed rock for road construction purposes, while the Lankershim plant, adjacent to North Hollywood, produces sand. Both plants are comparatively new, containing strictly modern equipment.

Officers of the Securities company are Charles E. Seaman, president; V. S. Hoy, vice-president; Fletcher White, secretary; Charles C. McWilliams, treasurer; and Kennedy Ellsworth, manager.

Aggregate Producer Has New Plant in Michigan

The American Aggregates Corp. of Greenville, O., is installing a sand and gravel plant near Sherwood, Mich., on a 20-acre tract recently acquired. The corporation has been awarded contracts for supplying sand and gravel for a considerable mileage of concrete pavement to be built by the state in Southern Michigan during the coming construction season.

Alpha Portland Cement to Develop More Power

The Alpha Portland Cement Co., Easton, Pa., has approved plans for the expenditure of $60,000 in extensions to its power plant at Martin's Creek, Pa.

Wabash, Ind., Stone Mill is Destroyed by Flames

Fire of unknown origin destroyed the Wabash mill of the Indiana Limestone Co., near Bloomington, Ind., on the night of March 26, entailing a loss of about $50,000.

Expend Huge Sums for Public Improvements

OUTLINE BUILDING PROGRAMS

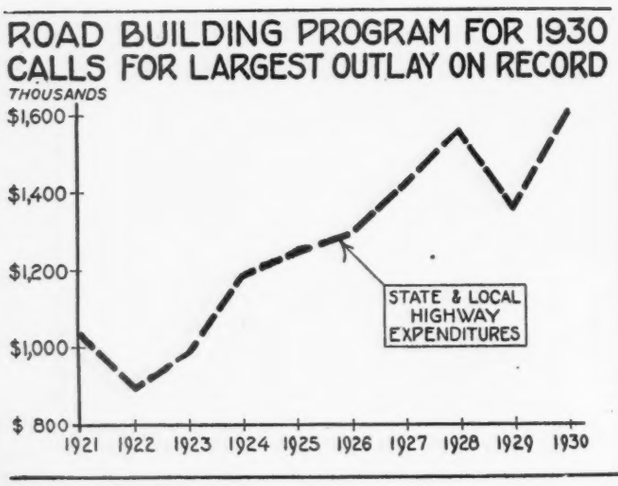
Nineteen-thirty will see $2,539,000,000 expended for construction and maintenance of public works and improvements by thirty-nine states, it is shown by latest compilations made by the U. S. Commerce Department of figures reported by state governors in answer to President Hoover's call.

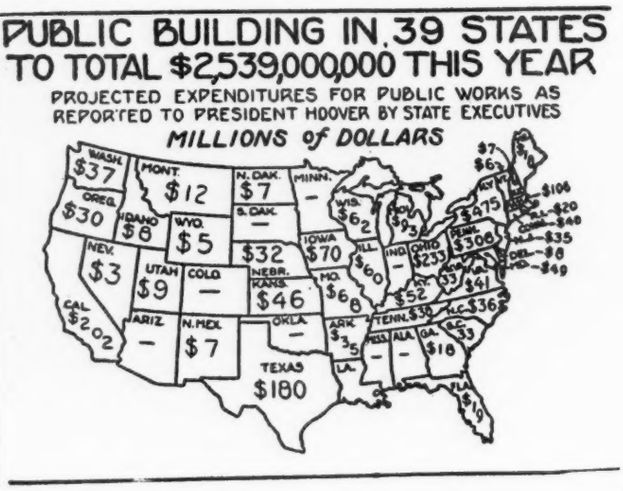
The total for all states, it is officially estimated, will exceed $3,000,000,000. Taken with the Federal, railroad and utility programs, this makes an aggregate of some $7,000,000,000 in public and semi-public building in sight for the year.

More than a billion dollars of new work is planned in three states alone. These are New York $475,000,000, Pennsylvania $306,000,000, and Ohio $233,000,000. Some other states with large contemplated expenditures are: California $202,000,000, Texas $180,000,000, and Massachusetts $106,000,000.

The sums to be expended by each state which so far has reported to the White House are shown in the accompanying diagram. In some instances the reports are preliminary and will probably show an increase when full returns are received.

Prompt action in speeding up the 1930 construction program is also seen by the Commerce Department, and this, it is anticipated, will aid materially in bringing about the improvement in employment conditions which President Hoover holds to be in prospect within the next 60 days.





Long Ship Channel to be Built in Michigan

EXTENSIVE TRACKAGE PLANNED

Construction of water transportation facilities at Bay Port, Mich., now under way by the Wallace Stone Co., producer and shipper of crushed stone, will make that village on the shore of Lake Michigan one of the busy ports on the Great Lakes.

The company is laying a standard-gauge railroad track from its quarries, east of Bay Port, to the shore of Wild Fowl Bay, a short distance northeast of Bay Port. Bins for storing and loading stone to ships will be erected at the shore.

The track will be about 13,000 ft. in length. A steam locomotive and four 20-ton capacity railroad cars, with air-dump equipment, will be used to carry the stone from the quarry to the shore. Bins with a capacity of 2,500 tons will be constructed at the shore. A channel 12½ feet deep and 80 feet wide will be dredged for a distance of about two miles off shore. Belt conveyors will load the stone from the bins to the boats.

Universal Atlas to Build Two Distributing Plants

The Universal Atlas Cement Co. is planning the construction of a distributing plant on the waterfront at Sixth and Canal Sts., Milwaukee, Wis. Plans call for the building of several storage tanks and a large structure to house the offices, packing plant and elevating equipment. Bulk cement is to be shipped by boat from the Buffington, Ind., plant.

A similar distributing and packing plant is being planned for construction at Chicago later on.

Converting Steamer into Self-Unloading Vessel

The steamer "William Nelson" owned by the Valley Camp Coal Co. of Cleveland, O., is being converted into a self-unloading boat using the Leathem D. Smith patented tunnel-scraper system by the Leathem D. Smith Dock Co. This boat is 360 ft. long with a beam of 50 ft. and a depth of 28 ft. and has a capacity of 6,000 tons. It is equipped with two 8-cu. yd. Crescent scrapers feeding through a hopper to a 54-in. inclined belt conveyor and discharging onto a 48-in. boom conveyor on 140-ft. centers. It will have an average discharge rate of 1,000 tons per hour.

This is the fifth boat in four years to be converted to the Leathem D. Smith system for this company. The others are the Kennedy, Valley Camp, Way, and Savage. All of these boats handle coal primarily with return loads of sand, sand and gravel, and stone.

Two considerations have influenced the company in its choice of this method of handling. One of these is the maximum cubic carrying capacity obtained which is important because the low specific gravity of coal allows loading to capacity.

The second consideration was the minimum of breakage or degradation. The following reasons are given for this. The large 36-in. by 48-in. door openings, at least 6 of which, with an area of 72 sq. ft., are open at one time, feed to the scrapers with a minimum of friction and breakage and no fall. The scraper on its return haul is raised sufficiently to clear the coal and does not fall on it. The discharge from the scraper is at slow speed and with no drop through a hopper to the inclined conveyor. The use of an inclined belt conveyor instead of a pan conveyor to feed the boom conveyor is claimed to reduce the vertical fall of the material to the boom conveyor about 8 ft.

Volume Index Reflects Advancement in Industry

The volume index which appears as Section Two of this issue of PIT AND QUARRY covers the material that has been published during the last twelve months, April 10, 1929, to March 26, 1930, inclusive. It provides a fuller indexing of subject matter than previous indexes, and gives wider recognition to the geographical location of the producing plants discussed in articles on plant operation. Minor improvements have been made in the style of the listings and in the extent of the cross references, the aim having been to provide ready access to the wealth of material that has appeared in recent months.

In its listing of plant stories the new index reflects the remarkable advances that have been made in the expansion and improvement of the nation's non-metallic mineral-production facilities during a year that witnessed comparative stagnation in many other industries. It indicates, too, the foresight of this industry's leaders and their faith in the future soundness of their business.

Asphalt Institute Has Complete Organization

NEW OFFICERS ARE ELECTED

The recently organized Asphalt Institute, which succeeded The Asphalt Association on January 1, has elected the following officers for the fiscal year 1930: Leroy M. Law, St. Louis, Mo., president; W. H. Kershaw, New York, N. Y., vice-president; C. W. Bayliss, Philadelphia, Pa., vice-president; B. L. Boye, New York, N. Y., secretary; and Fisher Jones, New York, N. Y., treasurer. J. S. Helm of New York is chairman of the executive committee and J. E. Pennybacker, also of New York, is managing director.

On or about April 15, the Institute will move to the new Crystal Building, 250 East Forty-third Street, New York, where it has leased, for five years, the entire eighteenth floor.

Columbia Cement Works New California Quarry

The Columbia Cement Co., which has plans under way for the construction of a plant at National City, Cal., has begun work on its quarry, which is situated four miles from the Imperial Valley highway leading into San Diego.

The company has completed plans for the construction of the plant and actual building is awaiting materialization of plans by the government and harbor department for the development of the inner harbor.

When the plant is completed, the firm expects to construct a spur track from the quarries to the main line of the railroad. The supply of raw material to be used is said to contain a calcium carbonate of lime 97 per cent pure. Kaolin clay for white cement is also available.

Concrete Institute Will Convene at Milwaukee

The officials of the American Concrete Institute have decided to hold the next annual convention at the Schroeder Hotel, Milwaukee, Wis., February 24-26, 1931.

Florida Cement Company is Expanding Operations

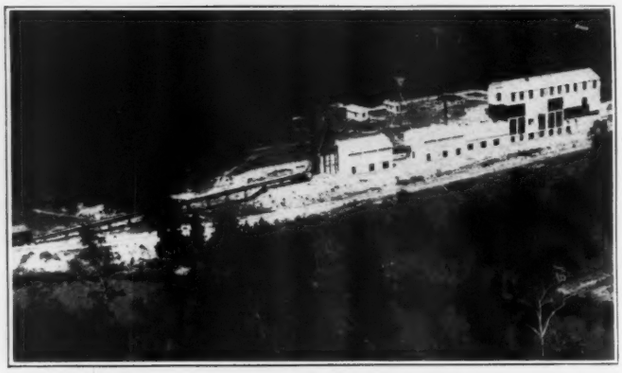
The Florida Portland Cement Co., of Tampa, Fla., plans to expend $80,000 in increased loading and docking facilities, and expects to be operating soon to capacity.

Oyster Shells Utilized as Raw Material in Making Lime Products

Hydrated and Masons' Lime Produced in Houston Plant of Haden Lime Co.

By T. K. KNOX

HOUSTON, Texas, is an important port and distributing center along the Gulf coast. Located there is the W. D. Haden Co., as well as the headquarters of the many other Haden interests. As this territory built up, these related companies grew with it; in fact, it might be said that the W. D. Haden Co., assisted substantially in building this city, for it is a large building-supplies distributor in this section of the country.



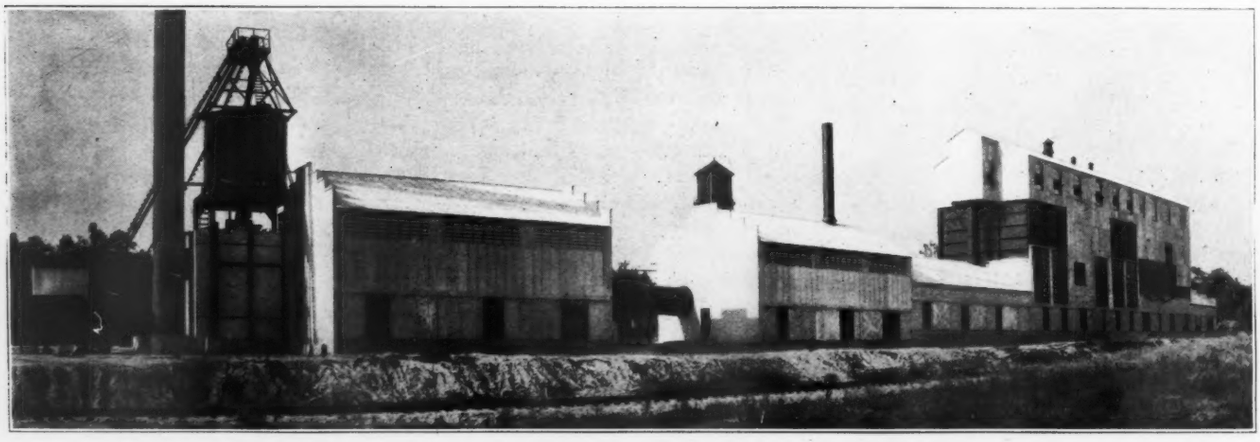
An iden of the plant's environment is found in this airplane view. Canal in foreground.

The Haden companies enjoy the distinction, ideal in business, of having the complete business cycle within their activities—that of raw material, manufacturing, and distribution. They have their own sand and gravel supply. They are large producers of oyster shells which are found along reefs or bars in the bay several miles from shore. They own many dredges, and they deliver these oyster shells for road ballast and to large Houston plants which use these shells as the calcicum-carbonate material in the manufacture of cement. (See article in January 1, 1930, issue of PIT AND QUARRY, "Shells and Clay Are Raw Materials Used at Trinity Cement Plant in Houston.")

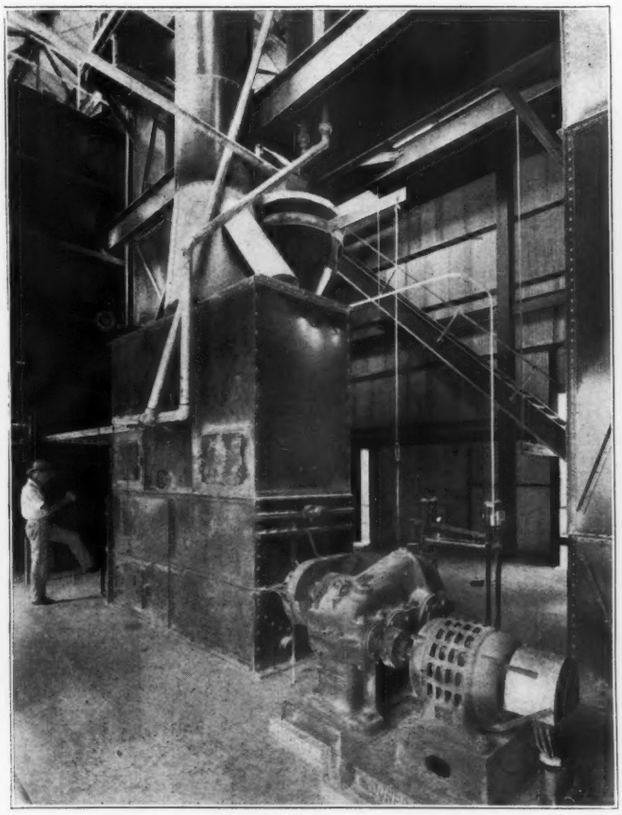
The Haden Lime Co. itself, which plant is located 15 miles east of Houston on Green Bayou, about 2 miles off the Ship Channel, also uses these shells. The general offices of the company are at 1720 Shepherd St., Houston, Tex. Plant construction was started in July, 1928. In October, 1929, the plant was completed and in operation. The products of the plant are quick lime and hydrated lime. Specifications and all details were made by the firm of Arnold and Weigel, contractors and engineers, Woodville, O.

One ordinarily associates a lime plant with a limestone quarry but, in this instance, shells are unloaded from the company's barges at its own wharf. The fact that this plant uses oyster shells as the raw material is a rather novel feature. The compactness of this plant lends itself to economical handling and burning of the lime.

The plant construction is Stone-Tile (a Haden product), corrugated-asbestos wall on structural-steel framework. The Stone-Tile forms the wall of the buildings for about 10 ft. from the ground. The plant office also is constructed of these Stone-Tile blocks, hence these buildings are attractive and neat in appearance, as well as substantial and abso-



Showing compactness of Hayden Lime Company's plant near Houston, Tex. Raw materials enter at left.



Hydrator, dust collector and water-measuring tank.

Conveyor which takes the shells from dock to plant.

lutely fireproof. The modern well-equipped laboratory of the plant is located in this building.

The plant is located 300 ft. from the dock or pier where the barges are unloaded by a ¾-cu. yd. Northwest gasoline crawler-crane. The shells are loaded into a hopper from which they are fed into a "jig-washer" or "desander," of the company's own make, which reduces the small content of foreign matter (mud and silica sand) to less than 0.75 per cent. From the jig-washer the shells are fed by a Stearns batch feeder to an 18-in. belt conveyor which delivers to a chain belt bucket elevator which, in turn, empties into a steel kiln-storage bin. The 18-in. conveyor belt is made by the New York Belting & Packing Co., runs on Stearns anti-friction Alemite-lubricated carrier and rolls, and its length between centers is 300 ft.

From the kiln-storage bin the shells are fed to the kiln by a 30-in. disc-type Bonnot feeder. A 1-hp. electric motor, through a gear reducer and flexible coupling, drives the feeder.

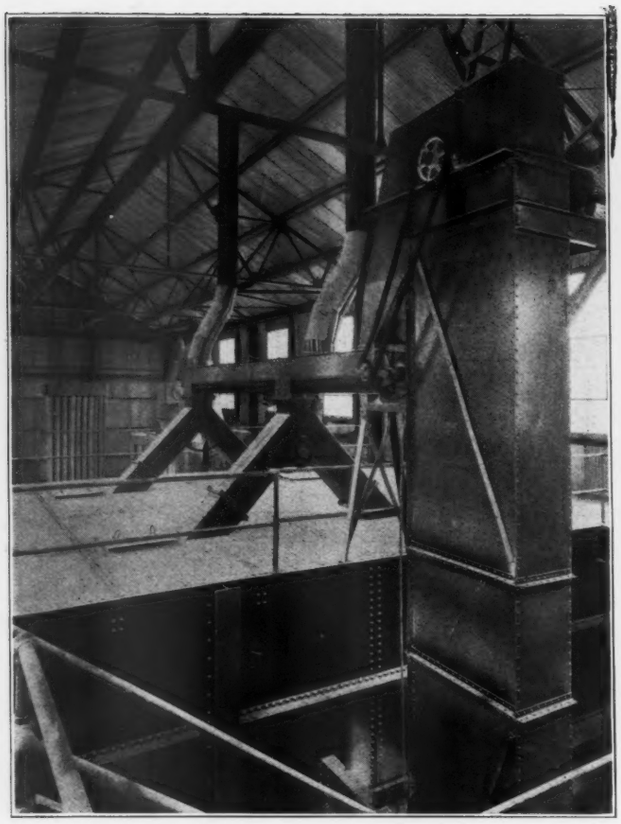
All motors in the plant are of Fairbanks-Morse make, incorporating ball bearings, moisture-proof windings, and dust-proof housings for slip rings and commutators. The controlling devices for squirrel-cage motors, up to and including 5-hp., are of the magnetic contactor across-the-line type with a proper thermal-overload protection and push-button station. For 7½-hp. and larger motors enclosed automatic compensators are used with overload and under-voltage protection employing push-button stations. For the slip-ring type motors the controlling devices are an enclosed magnetic-contactor panel, having overload and no-voltage protection, resistors and a drum controller to fit the requirements.

All gear reducers and flexible couplings were made by the W. A. Jones Foundry & Machine Co.

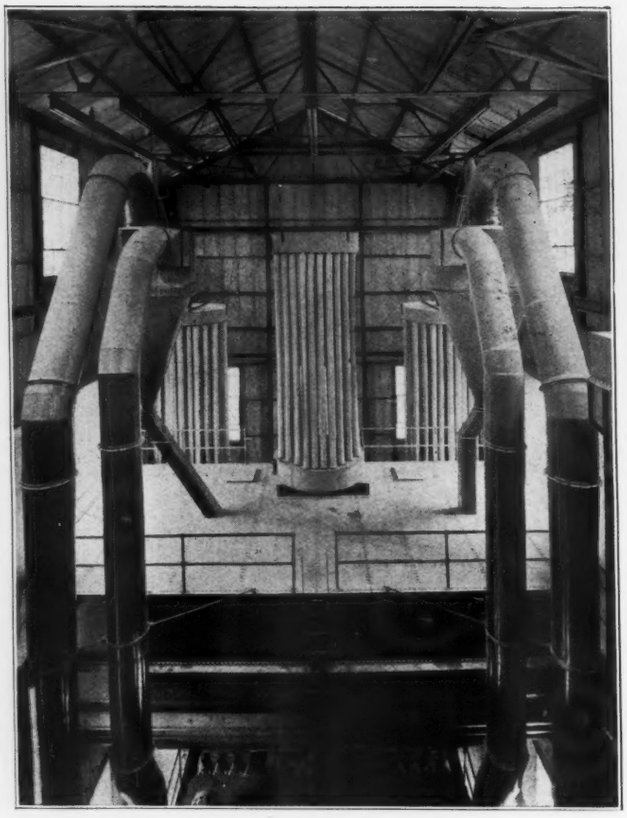
Burning is done in a 7-ft. by 125-ft. Traylor rotary kiln, lined with Coleman fire-brick. It is fired with gas through a Tate-Jones burner. Air to the burner is supplied by a 12-in. Sturtevant blower and natural gas is supplied by the United Gas Co. A temperature in the kiln of 2,150 to 2,200 deg. F. has been found to give the best results.

The lime from the kiln drops into a pit from which it is taken by a bucket elevator that delivers it to the 6-ft. by 60-ft. Traylor rotary cooler. From the cooler the lime falls through a dust-hood and is raised by a bucket elevator to a 14-in. screw conveyor which is mounted on and discharges into four 125-ton steel air-tight bins.

All bucket elevators and screw conveyors inside the plant were made by the Link-Belt Co. All the elevators, screw conveyors, dust-hoods and bins are



Enclosed elevator and screw conveyor for hydrated lime. The aging bins are shown below.



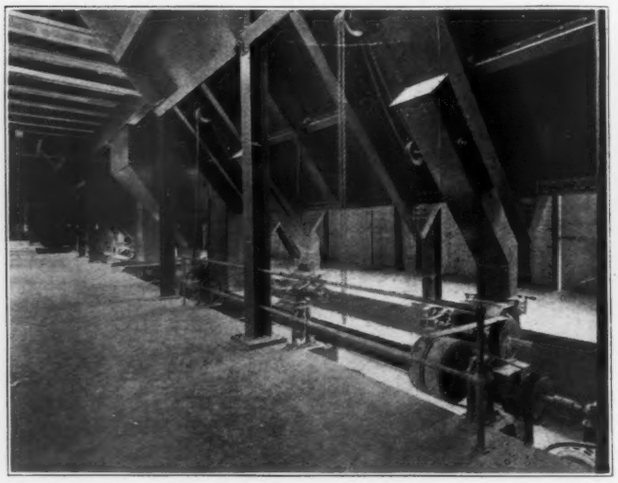
Central tubular dust collector is for the packers. Rear collectors are for mason's lime and hydrate superfines.

of steel, dust-proof construction and are painted a gray color.

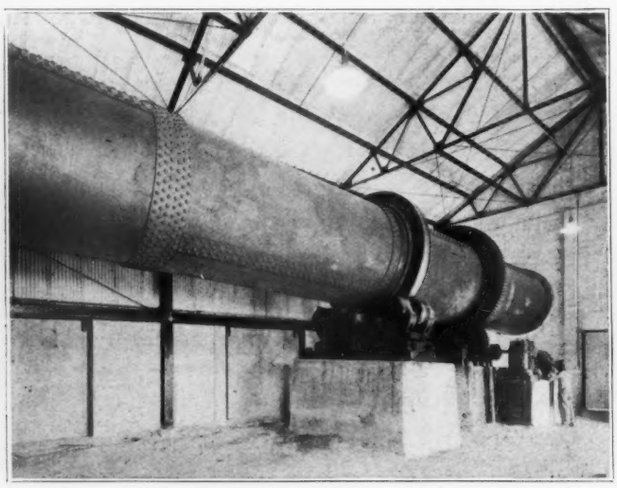
From the bins a 14-in. screw conveyor delivers the lime to a bucket elevator which, in turn, delivers it to the hopper of the Weber batch hydrator. Hydrator dust collectors with water measuring tanks are above the hydrator. The dust collectors exhaust to the air. Due to the extreme heat, 92 per cent by weight of water is used in the hydration. Twelve batches are mixed per hour.

From the hydrators the lime is first discharged to a hopper, from which it is drawn by a screw conveyor and delivered to a bucket elevator which, in turn, serves another screw conveyor that empties into the hydrate bin. This bin holds 500 tons and is divided into four equal compartments.

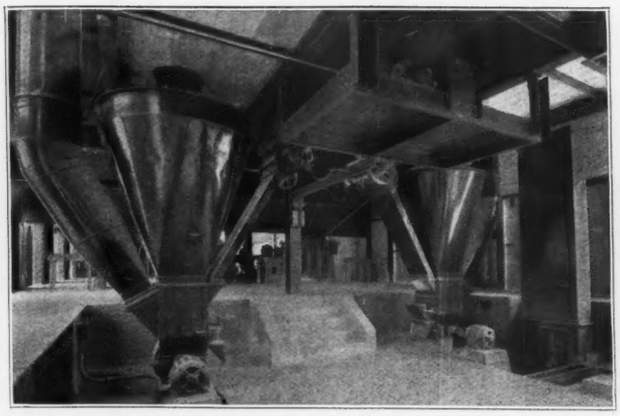
An average analysis of the hydrated lime over a 15-day period, made by the Houston laboratories, was as follows, in per cents: Silica 0.12, aluminum oxide 0.09, ferric oxide 0.05, calcium oxide 73.50, magnesium oxide 0.48; total volatile matter 25.36; available calcium oxide (non-volatile basis) 93.88.



Steel storage bins for lime, above reclaiming screw conveyors.



Portion of the rotary kiln, showing drive mechanism.



Pulverizer and baggers, showing dust-collecting pipes.

Office building at plant of Haden Lime Company.

The lime, according to T. A. Evans, of the Haden Lime Co., has a fineness of 99.6 per cent passing a 325-mesh screen. The analysis represents the average from a period of 90 days' operation and the figures were checked by several laboratories, as well as in the well-equipped laboratory maintained by the company.

This high analysis is perhaps the cause of the exceptional chemical activity of this lime and explains the pronounced demand for it by the trade. It is interesting to note, also, the analysis of the shells, which is as follows, in per cents: $CaCO_3$ 98.2; Al_2O_3 0.6; SiO_2 1.0.

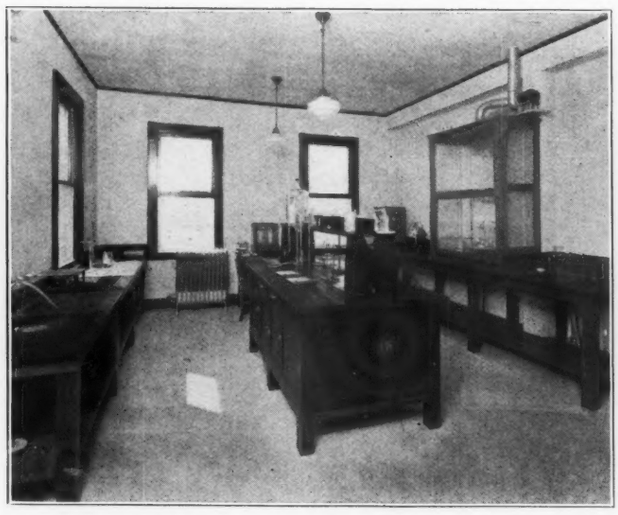
This analysis was made from the shells as they came from the dredge, before they were washed by the jig-washers. Although the shells, as they come from the dredge, are practically clean, there is a very small amount of sand which is removed by the jig-washers.

The hydrated lime is delivered from the bins by two 12-in. by 24-in. Raymond hydrated-lime feeders, to a 14-in. screw conveyor. The feeders are driven by belts from the screw-conveyor drive. This screw conveyor discharges into two No. 0 Raymond pulverizing mills. One of these mills is used for masons' lime, the other for chemical lime, and the plant is so arranged that these two products can be kept separate.

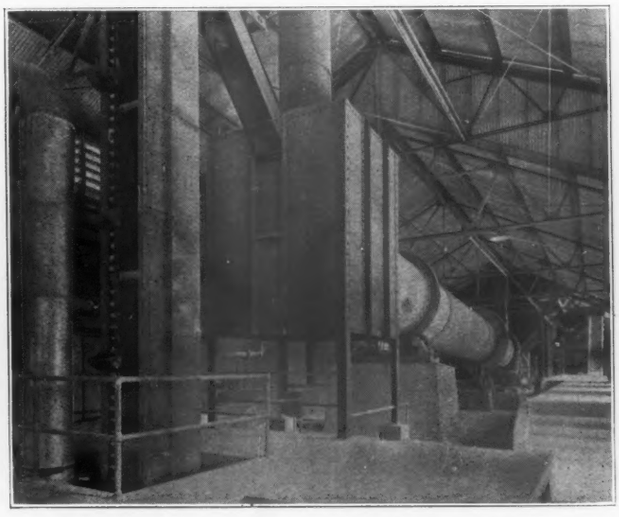
Two No. 11 Raymond exhausters discharge the lime from the Raymond mills to a Northern Blower Co. cyclone dust collector which, in turn, discharges into the steel bagging bin. All super-fine lime is collected by an 8-ft. tubular Raymond collector which discharges into a separate bin to be sacked.

A 4-tube Bates bagger is used for sacking each type of lime—that is, one for the masons' lime and one for the chemical lime. All spill from the packers is handled by a 6-in. fan that removes it from the side of the packers' housings and carries it to a 7-ft. tubular collector, from which it is discharged back into the bin.

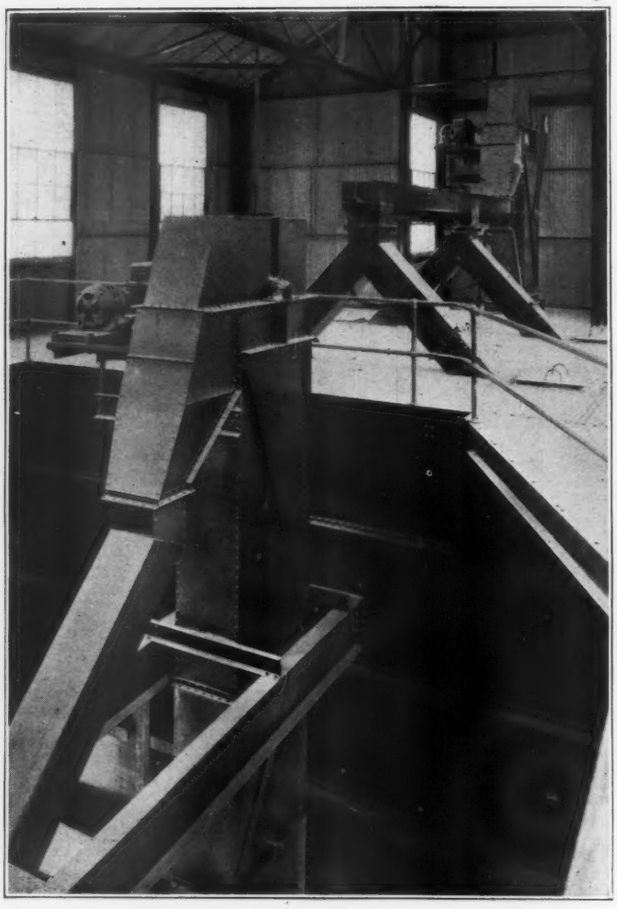
The lime is shipped in 40-lb. 3-ply multi-wall Bates paper bags with no water-proof liners. The daily capacity of the plant is 90 tons as proved by actual runs, but the daily output is held around 70 or 80 tons per day for the best operation.



Portion of well-equipped laboratory at plant.



Hot-air pipe (left), cooler in middle distance.



Elevator to hydrator (foreground), raw lime bins, and screw conveyors and elevator from cooler.

As the plant is located on the Missouri Pacific Railroad, shipments can be made by either water or rail.

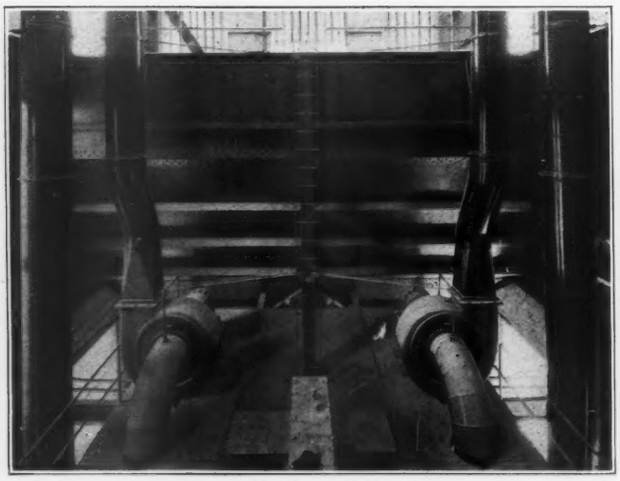
Provisions have been made for enlargement of the plant when desired. Additional room was provided for a second kiln and cooler and for two additional Raymond mills. The capacity of the plant could easily be doubled without disturbing operations.

Elevator from end of shell conveyor to kiln-feed tank.

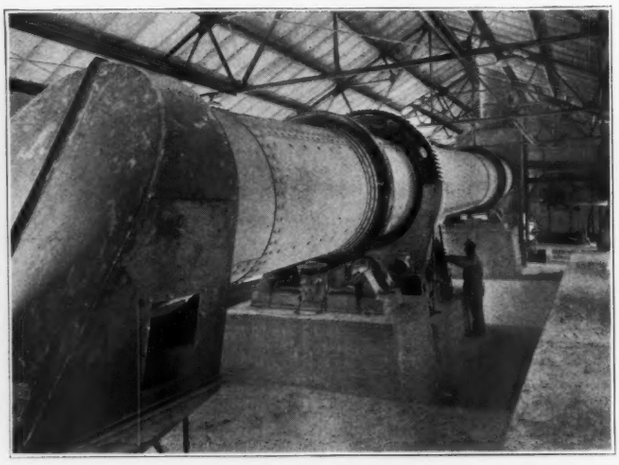
The plant is operated by eleven men. W. C. Carlson is the superintendent and T. A. Evans is chemist. In following out their policy of service to the trade, the Haden interests have a veteran of the lime industry as service director—Sidney P. Ormsby, formerly of the Dittlinger Lime Co., and of the National Lime Association.

The executive personnel of the Haden Lime Co. comprises W. D. Haden, president; W. A. Wansley, vice-president and general manager; E. D. Haden, secretary; and C. R. Haden, treasurer.

Another story of a sand and gravel plant at West Point, Tex., which is also operated by the Haden interests, will appear in a forthcoming issue of PIT AND QUARRY.



Fans above masons' and hydrated-lime bins.



Rotary cooler, and (rear) firing end of kiln.

Bits of Technologic Information about Gypsum and Lime Cements

Calcium an Essential Component of Industrial Cements and Plasters

By A. J. HOSKIN

ALL of the industrial or structural cements are manufactured from rocks in which the element calcium is a constituent if not the important base element. Rocks containing also silica and alumina are necessary in the manufacture of portland cement, but the various grades of limes and cements other than portland are made usually from limestone, chalk, or shell marl which are chemical combinations of calcium with carbon and oxygen; dolomite, a similar combination of both calcium and magnesium with carbon and oxygen; and gypsum which is a chemical union of calcium with sulphur and oxygen. When pure, none of these rocks contains either silica or alumina. Calcite, the natural carbonate of calcium, is the prevailing mineral in limestone. Indeed, all of the foregoing carbon-oxygen combinations are calcium carbonates, while the sulphur-oxygen combination is calcium sulphate.

The accompanying article is not intended to enlighten those who are closely engaged in the lime or gypsum industries, but it does offer brief, elementary, and non-technical explanations of a few phases of these industries which, perhaps, are not understood by many other persons. No attempt is made at complete discussions of the several topics.

In any one of these rocks or minerals the proportion by weight due to the element calcium is comparatively small—23 per cent to 40 per cent—and yet its presence is essential in the making of cements and mortars.

Burning or Calcining

The process of burning is universal in the manufacture of lime and gypsum cements. Strictly speaking, the word burning is a misnomer. Burning implies combustion which is merely rapid oxidation, that is, a chemical union with oxygen, accompanied by the creation of heat. In the commercial treatment of limestone to produce lime, on the other hand, an exactly opposite reaction occurs —there is removal of oxygen from the rock and heat, instead of being generated, must be provided. In the heat treatment of gypsum, the notion of burning is even more remote since neither oxidation nor deoxidation takes place in the kiln. A better term for this process is calcination, a word which comes from the root *calx*, Latin for lime, and which was coined to serve this particular purpose. In everyday parlance calcium compounds are known as limes, such as chloride of lime (calcium).

The calcium rocks, as they occur in the ground, contain some water which is not apparent to our senses as ordinary moisture. It is a natural component of the hard, solid substance of the rock. Among chemists this is termed water of crystallization or combined water.

When artificial heat is applied to these minerals, the combined water is removed as vapor, the minerals in consequence undergoing slight decrepitation or cracking. In the relatively few plants that conserve the gaseous educts from such rocks there is always present in the condensate a considerable quantity of water even when the raw feed to the kilns is perfectly dry.

Plaster of Paris

When gypsum is calcined there is no chemical alteration of the calcium sulphate, as such, but there is simply the removal of some of the water of crystallization. Pure raw gypsum carries nearly 21 per cent of structural water by weight. However, this must not be removed completely if plaster of Paris be desired as the product. The process involves a technique that will so hold the temperature and the period of treatment as to expel approximately three-fourths of the combined water.

Plaster of Paris possesses an affinity for water which it will assert promptly, when given an opportunity, in returning to the original chemical composition of gypsum. According to chemists the reaction is shown by the following simple formulae. Raw gypsum is $CaSO_4.2H_2O$. This formula shows that there are two molecules of water combined with each molecule of calcium sulphate. After the gypsum is properly calcined, the resulting plaster of Paris has the formula $2CaSO_4.H_2O$, which indicates only one molecule of water for each two molecules of calcium sulphate. In other words, the substance has retained just one-fourth its original quantity of water.

Plaster of Paris is acutely thirsty for its native allowance of water. The setting of this plaster depends upon this affinity or craving. If water be

mixed with the ground plaster, enough of the water will be absorbed by the plaster to regain the formula $CaSO_4.2H_2O$. Spontaneous heat will be created, recrystallization will occur quickly, the substance will turn hard—the cement will set.

Keene's Cement

If gypsum be calcined at sufficient heat to remove all of the combined water, it will be "dead-burned" and, peculiarly, the substance will have little or no affinity for water. In this condition it is not plaster of Paris but is known as Keene's cement. This material has distinct usages such as the surfacing of interior walls which must not set too quickly. This cement is a slow-setting cement and this property affords workmen plenty of time to use it for decorative purposes. Although slow in setting, it becomes ultimately surprisingly hard and durable.

Chemists are not agreed as to the reaction involved in the setting of Keene's cement. Complete calcination of the gypsum leaves simply $CaSO_4$ which, chemically, is identical with the mineral anhydrite that cannot be utilized in making this cement.

In Great Britain several manufacturers first calcine their gypsum to the condition of plaster of Paris. This is next soaked in weak solutions of alum, borax, or potash, and then recalcined to expel all of the water of crystallization. Upon being finely ground, this is known as Keene's cement. Inasmuch as the quantities of the added salts are really insignificant, it is difficult to explain their influence in the improved setting quality of the cement.

Lime Burning

From the chemical viewpoint, the burning of limestone is more involved than is the burning of calcining of gypsum. In both cases, there is the removal and evaporation of composition water. In the case of limestone, chalk, or shell marl, each of which is essentially a calcite or carbonate of calcium, the reaction produces as the end-product calcium oxide, a totally different substance chemically.

The raw material has the formula $CaCO_3$ plus differing amounts of water, depending upon the mineral. Disregarding the water component, all of which is expelled in the kiln, the burning process drives off carbon dioxide, CO_2, and leaves a solid residue CaO which is quicklime.

If the raw material be dolomite, a sort of limestone in which about one-half of the calcium is replaced by magnesium, the reaction is merely duplicated for the two elements. Pure dolomite is represented by the formula $CaCO_3.MgCO_3$ (disregarding structural water). In the kiln, this combination breaks up into one molecule of calcium oxide, CaO; one molecule of magnesium oxide, MgO; and two molecules of carbon dioxide, $2CO_2$. The properties of MgO are somewhat similar to those of CaO as regards their value in making cement, particularly when these two oxides are intimately associated as they are when dolomite is burned. Curiously, MgO alone does not make a good cement, hence magnesite which is the straight carbonate of magnesium is not used as a raw material in the manufacture of industrial cement.

High Gas Yields

The volumes or weights of carbon-dioxide gas that is driven from the rock during the burning process are significant items. Pure high-calcium limestone, when burned, yields approximately 44 per cent of its weight in this gas. Thus, for every ton of stone entering the kiln, there is the eduction of about 880 lb. of carbon dioxide. The corresponding yield by dolomite is about 960 lb. In actual practice, with high-analysis raw materials, the loss in weight of solid material due to the burning treatment is always more than these figures indicate because of the structural water in the original calcite. With poorer grade stone, however, the gas yield is somewhat less, due to the non-carbonate minerals which do not react under the heat.

These large quantities of valuable gas that have for many years been exhausted to and wasted in the atmosphere are being utilized now as resources in a few recent installations for the manufacture of so-called "dry ice," a refrigerant. The same figures prove also why lime-burning operations should always be conducted close to the quarries to avoid transportation charges on "gas."

Hydration

Quicklime, like plaster of Paris, is unstable. In fact, it is much more unstable than plaster of Paris. It retains an urge to return to its original chemical condition. It has been deprived of two substances which are universally present in ordinary atmosphere—carbon dioxide and moisture—and every observant person knows how difficult it is to keep lump quicklime intact in open storage. The lime will slake rapidly in a humid climate even if kept within a building.

In efforts to overcome this deterioration of lime during its storage and shipment, the prevalent practice of hydration was evolved. It was found that, by the addition to the quicklime of a definite quantity of ordinary water, the product would become converted into one that can be stored indefinitely without further deterioration. In imagination we can assume that the lime becomes satisfied for the time being if its thirst be but partially assuaged. Heat was required to drive off the original water in the stone; now heat is generated when the water is returned. Although hydrated lime requires slaking with additional

(Continued on page 58)

Gypsum Rock Used in New Hampshire Plant Shipped from Nova Scotia

Pneumatic Pumps Handle Ground Material Before and After Calcination Takes Place

By F. A. WESTBROOK

THE plant of the Atlantic Gypsum Products Co. at Portsmouth, N. H., was placed in operation two years ago and embodies several rather unusual features. The site of the plant was a war-time shipyard which provided good docking facilities and a considerable amount of equipment which could be utilized. The calcining plant is, of course, entirely new, building and all, but the other inside operations are conducted in buildings which were already available.

The company's supply of crude gypsum rock is drawn principally from its quarries at Cheticamp, Cape Breton, Nova Scotia, where a modern large-scale operation is conducted. The construction work and mechanical installations, including quarries, and crushing, storage and loading plants, were completed in May, 1929. It has a daily capacity of 2,000 tons of gypsum rock crushed to 4-in. and under for ease and economy of handling. These deposits provide an almost inexhaustible supply of high-grade gypsum rock for the company's plant and for its Canadian cement and gypsum customers.

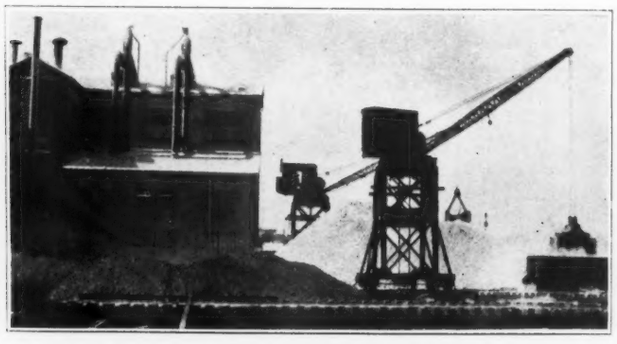
The company also operates at quarry at Walton, Nova Scotia, near Windsor, on the Bay of Fundy, from which a part of its own requirements and those of its cement and fertilizer manufacturing customers on the Atlantic Seaboard are supplied. A new quarry is being developed by the company at Aspy Bay, Cape Breton, for its supply of selected white rock for gauging, molding and special plasters. This is probably one of the most extensive deposits of pure white gypsum rock in North America. The development of a quarry, crushing and loading plant for this operation will be completed during the present year.

The stone is transported from Nova Scotia in steamers of up to 6,000 tons carrying capacity to the company's gypsum mills along the Atlantic and to its Canadian customers at Montreal. Excellent shipping conditions are provided by the natural harbor at Cheticamp.

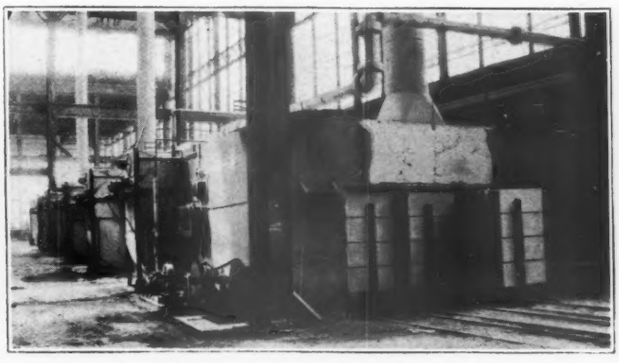
The steamers are unloaded at the company's dock at Portsmouth by means of two Brownhoist portable cranes in simultaneous operation. One crane is equipped with a Hayward 2½-cu. yd. clamshell bucket and the other with a Brownhoist clamshell bucket of the same size. These load the stone into two steel freight cars for transportation to the calcining plant. The unloading operations is done at the rate of about 300 tons per hour. The cars are hauled the short distance from the dock to the calcining plant by a 50-ton Vulcan locomotive.

On arrival at the plant the freight cars are unloaded by means of another Brownhoist portable crane and a Brownhoist locomotive crane on the stock-pile. Because of the severity of the winters, it is necessary to bring down from Nova Scotia, during the shipping season, enough rock to last during the close season, and, to this end, something like 40,000 tons are accumulated in storage by the end of the season.

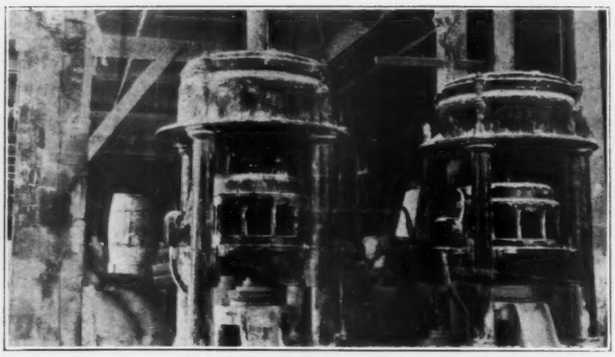
A fourth Brownhoist portable crane with the same make of clamshell bucket is used to take material from the storage for the supply of the calcining plant. It places the raw stone in a hopper from which the plant is fed. From this hopper the stone is dropped by a reciprocating feeder to an



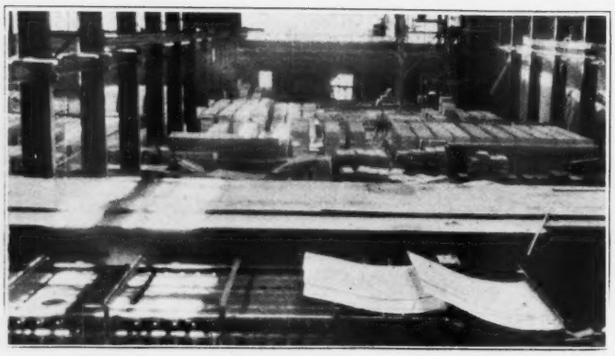
One crane unloading rock from freight cars, while other crane supplies rock to the calcining plant.



Gypsum block dryer in the plant at Portsmouth, N. H.



Mills for regrinding calcined gypsum used in finishing plaster.



Wall-board manufacturing machine.

18-in. Robins belt conveyor with a Magnetic Manufacturing Co. magnetic separator to a Pennsylvania single-roll crusher. The stone as received from Nova Scotia is 6 in. and under in size and in this crusher is reduced to 2 in. and under.

From the crusher the stone is raised by a Goodyear bucket elevator to a 450-ton capacity steel silo made by the New England Iron Works. A reciprocating feeder, driven through a Reeves variable-speed transmission beneath this bin, discharges the stone to a belt conveyor about 175 ft. between centers, which, in turn, feeds the Ruggles-Coles dryer. The dryer is heated by a furnace equipped with a Huber hand stoker. A Clarage exhausting fan removes the gases of combustion and dust and deposits them in a By-Products Recoveries dust collector.

The dried rock then drops into a Pennsylvania hammermill and is further reduced in size. It is next conveyed by a Sturtevant screw conveyor and an elevator of the same make to the upper level and delivered to the steel hoppers, made by the New England Iron Works, above two Raymond mills. These mills and their fans are driven by General Electric motors, through a Ramsey chain drive. The ground gypsum rock resulting from this operation is land plaster. This plaster next passes through the Raymond cyclone separator into the Sturtevant screw conveyor, which delivers it to the 70-ton land-plaster bin.

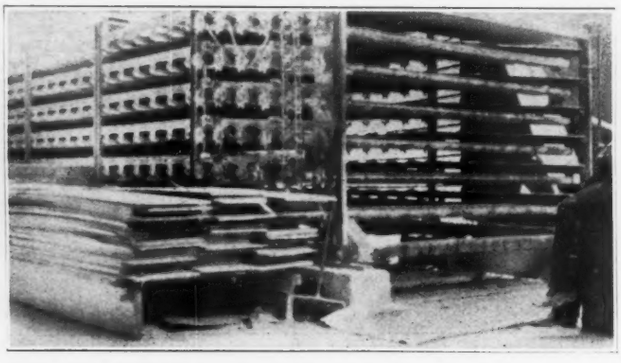
Under the land-plaster bins are Fuller-Kinyon pumps, said to be the first ever installed in a gypsum plant. These operate most successfully in delivering from the plants to the bins above the two calcining kettles. Calcining is done in batches. Heat is generated by the burning of slack coal on Huber stokers. The kettles are controlled from a desk on which there is a recording thermometer for each kettle and an ammeter for each motor. Filling and discharging into the conical steel hot-pits are controlled from this same desk by means of Westinghouse air valves.

Calcined gypsum is removed from the hot-pit to another set of Fuller-Kinyon pumps by a Sturtevant screw conveyor. One of the principal objects of this screw conveyor is to regulate and retard the flow of the material and to keep it from flooding the pumps. Adjacent to the kettle control desk is the Fuller-Kinyon indicating board, by means of which the delivery of material by the pumps to its proper destination is definitely indicated at all times. These control devices, the grouping of the electrical controls at a few points of easy access, and the simplicity of the layout make it possible for four operators to take care of the whole grinding and calcining plant.

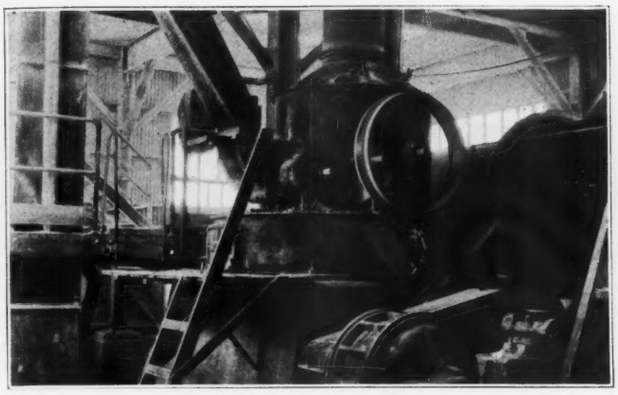
Each kettle is equipped with a By-Products Recoveries dust collector. A Pangborn dust collector system handles the dust from the various screw and belt conveyors, the Raymond separator, elevators, and bins. The collectors deliver all of the dust to the main screw conveyor which feeds the land-plaster bins.

By means of the Fuller-Kinyon system the cal-

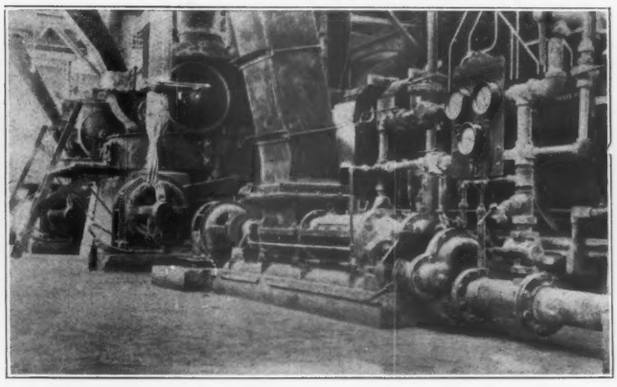
Skid-load of wall-board on lift truck.



Removing wall-board from dryer to skids.



Hammer mill, with a view of dryer in rear



Pumping system beneath the land-plaster bin.

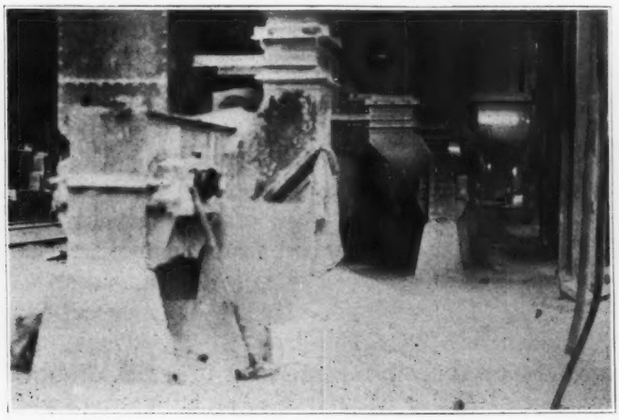
cined plaster is delivered from the hot-pits to numerous points or departments in the manufacturing building, all shown on the indicating board. In one of these departments the neat plaster, wood fibre, bonding plaster, and block setting cement are made. From the bin in this department the plaster is sent by a screw feeder to a Smidth tube-mill and, after being ground, it is delivered by another screw conveyor to a Fuller-Kinyon pump, which deposits it in bins. The material may then be drawn off from these bins into an Ehrsam weigh hopper and mixer of the same make where the fiber and retarder are mixed in with the gypsum. The finished mixture then drops into the bin over a four-spout Bates packer.

Another bin in the manufacturing building is used for material in the preparation of white plaster and gauging or finishing plaster. The latter is sacked from the bin, but the white plaster is reground on Munson buhr-stone mills and then is sacked or barreled directly from these.

The wallboard department is one of the largest and most important. Calcined gypsum is delivered by the Fuller-Kinyon system to a New England Iron Works large steel bin in this part of the plant. Adjacent to the bin are two others for storing sawdust received in freight cars and deposited in the bins by two Sturtevant elevators which discharge by gravity into enclosed Ehrsam drag conveyors delivering to the belt spindle mixer.

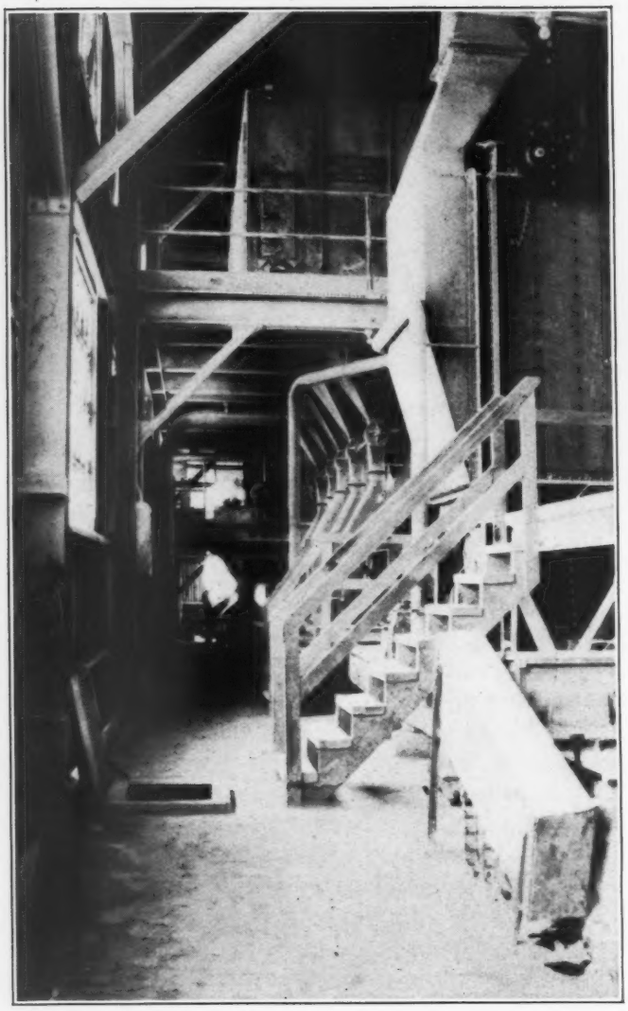
The mixture of stucco and sawdust is conveyed by an Ehrsam screw conveyor to a steel bucket elevator which delivers it to the Ehrsam wallboard machine. The mixture, when first delivered to the machine, comes out on the broad belt and is spread by a series of discs, much like those of a disc harrow, into a series of small parallel ridges and valleys. Water is allowed to run into the valleys. At the end of the belt, which is about 20 ft. long, there is a sort of paddle-wheel which mixes the material into a mortar. It is then discharged onto paper on a long section of the machine, where it is spread out evenly with a similar sheet above. As the two sheets of paper with a layer of mortar between them progresses through a series of rolls an even thickness is produced and the edges of the paper are properly folded over. After passing along a series of rolls for some distance to give the motor a chance to set a little, the board passes through a section of the machine having a belt on top and one below and in which sufficient pressure is exerted to press down the edges securely. Then comes a long section where further setting takes place, followed by cutting into proper lengths.

After cutting, the sheets are transferred by rolls, very much as steel plates are handled in a rolling mill, to the Coe Manufacturing Co. dryer. This is a six-tier oven 135 ft. long, followed by a cooling section of about one-third that length. As the



Drag conveyor under steel sawdust and stucco bins, to mixer.

Indicating board of the pneumatic pumping system.

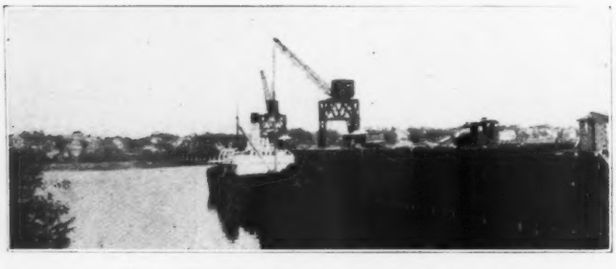


Two types of dust collectors in the Portsmouth plant.

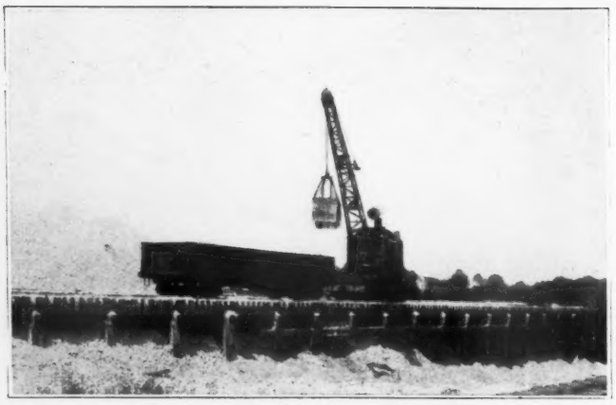
boards are taken out, they are placed on skids, which are picked up by Elwell Parker lift trucks and taken to the stock house or freight cars direct.

A Gibraltar machine, manufactured by the Gypsum Engineering and Manufacturing Co., is used to manufacture blocks. The products made here, including the Rockwall line of gypsum products, are well known and used all over New England and the Atlantic seaboard.

The plant is fully electrified. General Electric Co. motors, with Allan-Bradley starters, are used throughout. As stated, a striking feature is the convenient way in which the control equipment has been grouped in a few places so that extremely



Unloading steamer at company's dock.



Locomotive crane unloading freight car to storage.

easy control is possible. The plant as a whole and all the special machinery were laid out and designed under the supervision of H. J. Brown, consulting engineer, Boston, Mass. The foundations and concrete floors were constructed by Barrows and Co. of Boston, and the structural steel work was by the Palmer Steel Co. of Springfield, Mass.

The company also operates a products plant at 150th St. and East River, New York City, and another at Chester, Pa., on the Delaware River. This latter plant was purchased from the Pennsylvania Gypsum Co. in 1928 and is well located to serve the Philadelphia metropolitan market and the Middle Atlantic States.

The main office of the Atlantic Gypsum Products Co. is at 40 Central St., Boston, Mass. The officers are: Willard P. Fuller, president; Henry M. Channing, secretary; Frederick Winant, Jr., treasurer, all of Boston, Mass.; P. O'Malley, vice-president; and O. A. St. Clair, chief engineer, both of New York City.

Farmer Praises Marl Dust as Real Soil Reviver

H. B. Hanger, Jr., of Richmond, Ky., sends us the following item about his experiments in farming. It presents information that may be useful to our readers who are in position to produce marl. Mr. Hanger owns 13 acres of this mineral which lies 4 ft. deep. According to tests made several years ago, it is a high-grade lime. About five years ago he spread some of this material upon 100 acres of land "which would not grow anything." Clover was then sowed and he reaped a wonderful hay crop, in addition to a seed crop that paid for a clover huller and furnished seed for another year. The ground was plowed deep last spring and was planted to two varieties of corn. "My corn," says Mr. Hanger, "was the best in my county and farmers come from far and near to see it. Twenty-one acres filled a 640-ton silo, or an average yield of 3½ tons of corn fodder per acre."

Gypsum as a Fireproofing and Insulating Agent in Canadian Construction

By Maj. GEO. M. THOMSON
Director of Research, Gypsum, Lime and Alabastine, Canada, Ltd.

WITHIN recent months a learned judge of the Supreme Court in one of our provinces, rendered a decision in which he stated "that gypsum is not a mineral." One of the daily papers of that province undertook to elaborate on that decision and published the following: "Of course, it isn't. Who under the sun ever thought it was? Gypsum is a vegetable—like macaroni. It grows on the arid desert plateaus and is harvested each year by bands of gypsies. That is where it originally got its name 'gypsum' from the 'gypsies.' A verb bearing the same root and springing from the same source is 'gyp'. In times past bands of gypsies, to get ahead of neighboring tribes, used often to harvest the crops—or outcrops—of gypsum before it was ripe and sell it to deluded customers as the matured product. Thus it sprang up that a customer who had been cheated on gypsum by gypsies was said to have been 'gypped'. We might state in closing that gypping on gypsum by gypsies is most common in Egypt."

The author of this paper, Major Geo. M. Thomson, is an outstanding Canadian research engineer whose wide experience has made him an authority on gypsum and other non-metallic minerals. This paper, while not intended to be highly technical, gives our readers an opportunity to compare the ideas and developments in this industry in the two countries.

This recital is not intended as an effort to be facetious, but as illustrating the necessity of missionary work still required in proclaiming our vast heritage in non-metalliferous minerals.

So that we may consider this subject from premises common to us all, it seems in order to state rather well known facts.

Crude gypsum rock, as quarried or mined, is a definite mineral, with very definite characteristics.

There is not sufficient time available to discuss its geological origin.

Gypsum, chemically, is a form of calcium sulphate, but it has valuable properties which are lacking in pure calcium sulphate.

Pure gypsum contains, by weight, approximately 4/5 calcium sulphate and 1/5 water, but that contained water is not in liquid form; it is crystallized as a solid material, and it may be compared to ice as a solid crystallized form of water.

Ice melts at freezing point, or 32 deg. Fahrenheit.

The congealed or crystallized water combined in gypsum will be melted and expelled as moisture vapour if heated at or above the boiling point of water (212 deg. F.).

If the temperature is raised sufficiently and retained for the necessary period, all the crystallized water will be melted and evaporated, leaving a waterless calcium sulphate, called anhydrite, which, by the way, is not of eminent service commercially.

However, we know that if crude gypsum is heated at a proper temperature for a certain maximum period, one-quarter of its combined water may be left unmelted and still combined with the calcium sulphate. Such a procedure provides a form of calcium sulphate that is of great service commercially and is universally known as plaster of Paris, its first European production having been within the environs of Paris, France. It is worthy of note that history has been repeated, although inverted, by naming Paris, Ontario, after the plaster of Paris or gypsum deposits existing within its environs.

Certain minerals such as sodium silicate, plaster of Paris, etc., and some organic materials, such as sugar and glue, which although in dry form contain a small amount of water, are capable of dissolving most quickly if their individual particles are surrounded by mere films of water and not submerged.

Plaster of Paris, when suitably pulverized and mixed with water, has the natural ability to regarner the amount of its lost water. The particles commence to dissolve, saturating the surrounding water, resulting in a precipitation of new gypsum crystals which grow in size as the plaster of Paris particles dissolve.

Thus most gypsum products are fabricated by converting the mobile plaster of Paris into its original form, gypsum.

The individual gypsum crystals are needle shaped but too small to be seen by the naked eye. The average crystal length is about one thousandth of an inch and its diameter is about one-tenth of its length. Any piece of gypsum is a mass of these tightly interlaced needle-shaped crystals.

That is the story of the mineral itself and its adaptability for quick conversion to desired shapes.

* From an address delivered at a meeting of the Toronto Branch, Canadian Institute of Mining and Metallurgy.

The romance of gypsum dates back ten thousand years or more to when gypsum plasters were put to use in Egypt as coatings or plasterings. The gypsum industry on this continent has expanded rapidly during recent years; far more rapidly than on other continents. This rapid growth is not an accidental or sporadic occurrence. It is related closely to the industrial activities and requirements of this era of high buildings. Such structures require a degree of fire-resistance that will protect the inhabitants and the buildings themselves from destruction. It is an unfortunate fact that loss of life is the usual stimulus to greater effort in solving problems where greater safety is entailed.

Some of the earlier steel buildings met with disaster through fire, not because the steel or its surrounding protective materials were combustible, but because sufficient heat was transferred to the steel through its surrounding protective materials that permitted the steel columns and girders to bend.

Major Geo. M. Thomson.

Steel heated to a comparatively low temperature will bend under pressure, although it may lose none of its tensile strength. It was realized that the steel members of a building must be kept cool during a fire, and structural engineers presently realized that nature had endowed them with a material that could not be heated readily to a temperature necessary for combustion, nor could it be heated to a temperature that could affect contained steel members.

High Boiling Point

As a building material, gypsum is quite unique, in that it cannot be heated to a temperature higher than the boiling point of water until all of its crystallized water has been melted and evaporated. A published test by the Fire Underwriters' demonstrated that a solid gypsum tile, 3 inches thick, when subjected on one side to a temperature of 2100 deg. F. for three hours was less than 200 deg. F. on the unexposed side. Recognition of that characteristic of gypsum has mainly caused the recent increase in its use as a structural material.

We understand it is desired that some mention be made of research. Our chief executive has seen the industry grow from small beginnings and as it continues to grow he becomes the more determined that ceaseless research in pure science and of a practical nature be prosecuted continuously.

Through a more thorough understanding of the minerology of gypsum, we have found a purely mechanical method of dissolving plaster of Paris in smaller amounts of water, permitting a denser interlacing of gypsum crystals, and thus fabrication of stronger products.

Improvements Sought

Efforts are being made constantly to improve the quality of products and create such new products as are required for domestic and foreign markets.

Our consulting architect is a man of small stature but of great and fearless thoughts. He dreamed a dream that involved the development of a purely Canadian type of architecture suitable to a climate perhaps less genial than enjoyed by our neighbors to the south. He dreamed of comfortable winter shelter for those pioneers who are gradually pushing our frontier farther north, and shelters that could not be destroyed by forest or other fires. Realizing that even though our Canadian lumber industry has been hit hard by the campaign for so-called "fireproof" buildings, he also realized that wood is the most easily obtained construction material in our northern districts. Accordingly, he set about making wood structures fire resistant. How well his dream has been accomplished can be judged from the fact that henceforth all buildings owned and used by our organization are to be made fireproof as soon as possible, and we expect to be carrying our own fire insurance in the near future.

On commencing the experimental work required the problem was analyzed and the following discovered:

Fire or combustion is the oxidation of materials at certain fixed minimum temperatures which are considerably higher than normal. Combustion can be prevented if the combustible materials are kept below the required burning temperature, and if they are sealed from air currents necessary for the supply of oxygen to support combustion.

We realized the function of water in subduing a fire. Water merely lowers the temperature of the burning material below that required for combustion.

It is difficult to prevent furnishings from being consumed by fire, but fires should be confined to small spaces, and in large auditoria, ceilings or roofs should be kept cool so the hottest gases resting against the ceiling cannot burn through, permitting a chimney effect with rapid changes of air.

The solution of the problem proved to be the covering of all exposed combustible surfaces with gypsum and filling all spaces in walls, ceilings and roof with gypsum insulating materials.

Gypsum-Products Plant on East River Serves New York City Area

Big-City Location Necessitates Use of Extensive Dust-Collection Means

By O. A. ST. CLAIR
Chief Engineer, Atlantic Gypsum Products Co.

THE New York City plant of the Atlantic Gypsum Products Co., Inc., located in the Bronx at 150th Street and East River, is interesting in an historical way as well as in equipment.

In 1904 the Rock Plaster Co. of New York and New Jersey erected a plant on the site of the present plant. At that time the adjacent shore of the East River was a bathing beach, and wooded picnic grounds adjoined. Hand-selected rock, man size, was shipped in from Amherst Point, Nova Scotia, in sailing vessels of approximately one-thousand-ton capacity. The calcining equipment at that time consisted of four 10-ton kettles. Later, the name of the company was changed to the Rock Plaster Corp., under which name it operated until taken over by the Atlantic Gypsum Products Co. in 1926.

In 1908 a wet mortar department was made a part of the plant. Ready-mixed lime mortar was shipped in barges to various points, where the mortar was transferred to specially-built dump carts in which the material was conveyed to the job. This department has since been discontinued.

In December, 1913, the frame mixing building, or warehouse, was destroyed by fire but was immediately replaced by a 5-story reinforced concrete and brick structure. In 1927 the original calcining building was burned and was at once replaced by an up-to-date steel-concrete building.

Rock Handling

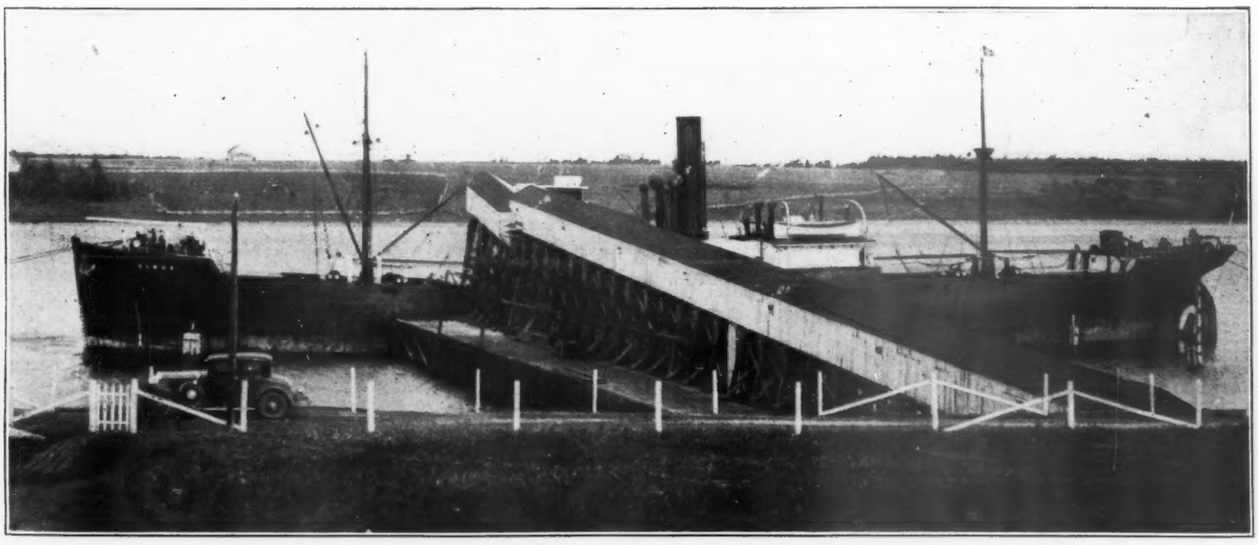
At the present time, a new 50-ft. by 200-ft. pier is being constructed and a Mead-Morrison steam-operated unloader, having a capacity of 5,000 tons of crushed gypsum rock each 24 hours, is being erected on the new pier. With these new unloading facilities it will be possible to handle, at low tide, vessels having a draft of 22 ft.

From the unloader, the rock will be discharged to a 30-in. belt conveyor, which, for the present, will discharge into a loading hopper from which gable-bottom cars will be loaded. These cars are operated on a trestle by an endless cable, and from them the rock is put into storage. Tentative plans have been prepared for a reinforced concrete-steel storage, which will be equipped with belt conveyors, to replace the present car system.

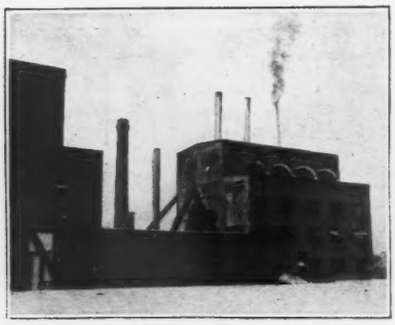
Sand and coal will be handled by the same equipment as that which handles rock.

One unusual feature in the equipment is the type of kettle drives. Each kettle is equipped with a 20-hp. Swedish helical-geared motor with spring coupling, which eliminates all but one countershaft.

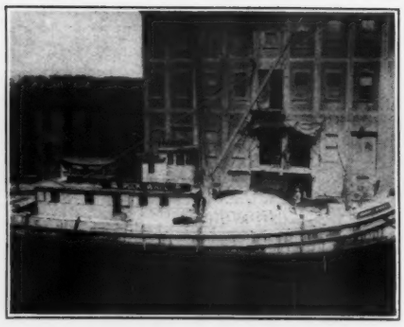
The flow of material through the plant is similar to that in most gypsum plants which have been



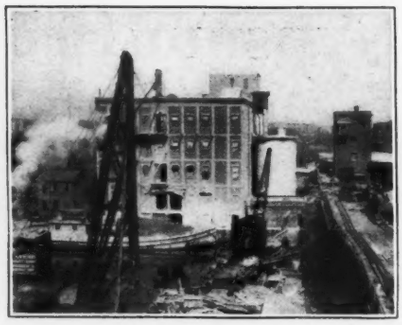
Steamer being loaded with raw gypsum at Cheticamp wharf of Atlantic Gypsum Products Co.



Calcining and grinding building, New York plant.

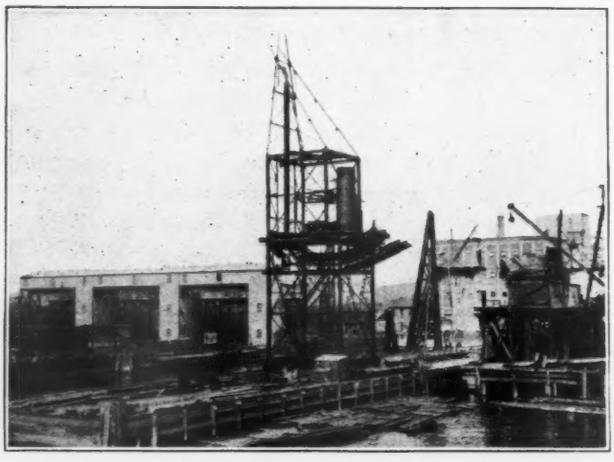


One of two lighters owned and operated by the company.



Mixing and shipping warehouse, New York plant.

constructed in recent years. From the stock pile, the rock is put through a pot crusher, a rotary dryer and a swing-hammer mill. From the swing-hammer mill, in which the cage bars are widely spaced, the rock passes to Raymond 5-roller mills. The Raymond Cyclones discharge into a screw con-



Unloader on new pier at New York plant during erection.

veyor which discharges directly into the land-plaster bins ahead of the kettles. After calcination the material goes to the tube mills for grinding and the stucco is conveyed by screw conveyors and bucket elevators to the storage bins and silos ahead of the mixers.

The mixing and packing equipment consists of two 4-spout Bates baggers, each supplied through two Broughton mixers, with another Broughton mixer for hand sacking of sanded material.

At present, a rotary sand dryer is being installed to take the place of the original dryer. The old dryer was designed by Thomas A. Edison and was intended to dry quartz. It is rectangular in cross-section, the sides being of cast iron, and stands in a vertical position, with a series of baffles inside. Wet sand is elevated to the top of the dryer by a bucket elevator which discharges directly into the sand dryer. As the sand falls through the dryer, it is broken up by the baffles and meets the hot gases from the furnace.

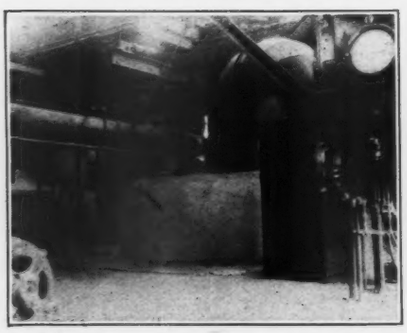
Dust Elimination

In order to comply with health department requirements, the dust collection and elimination equipment of the plant is quite extensive.

In the calcining and grinding department, suction pipes from Raymond Cyclone vents, elevator casings and screw-conveyor boxes are run to a Sly collector and the collected material is returned back into the land-plaster stream.

To collect the dust from the calcining kettles, cloth-type collectors were installed on three kettles and a mechanical collector on the fourth. Recently one of the cloth-type collectors has been replaced by an expansion chamber fitted with parallel baffles, and the exhaust from this chamber is knocked down by a series of water sprays. This arrangement has proven so satisfactory and economical in maintenance that it is planned to change all of the kettles to this same system.

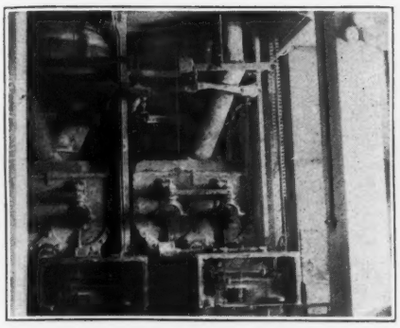
The rock dryer was originally equipped with a patented collector, but it has been replaced by a



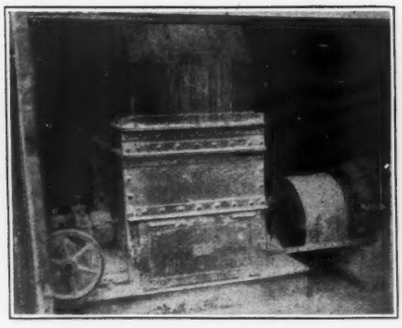
Upper portion of one kettle, vent pipe from hot pit, and pipe from plaster bin.

View in tube-mill room in which the calcined material is reduced to stucco.

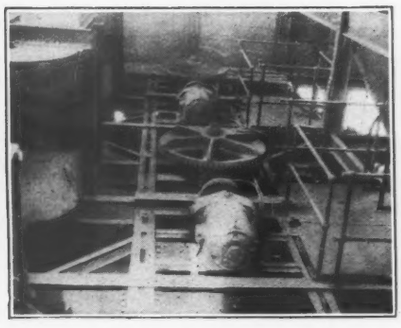
Each of these fans is driven through rope drive by its separate motor.



Two mixers and weigh hoppers, above one bagger.



Hammer mill that grinds gypsum rock after drying.



Kettle drive, with helical-geared motor and spring coupling.

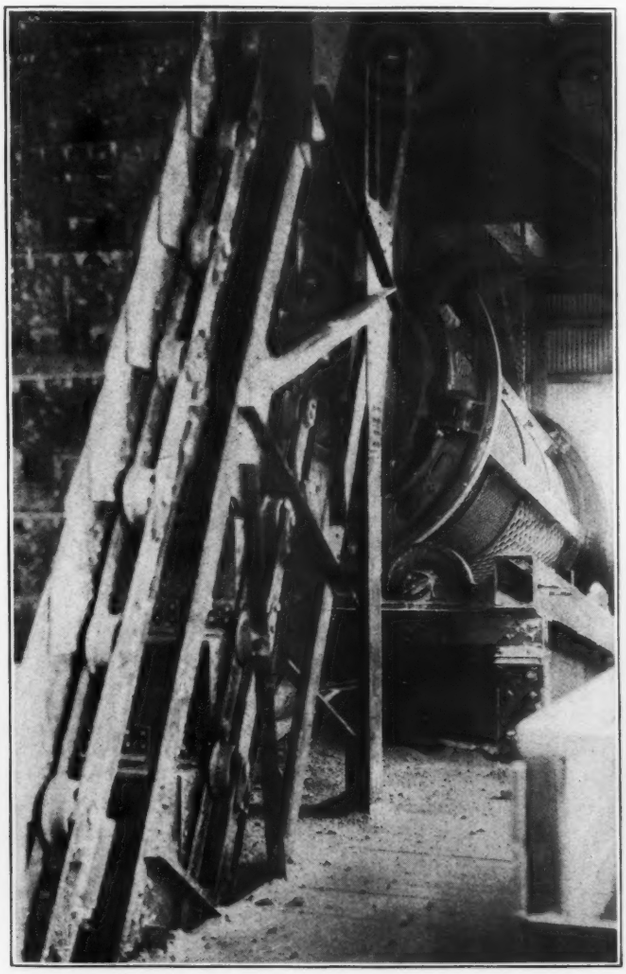
water-spray collector designed by the company's engineers.

In the mixing plant are two Sly collecting systems, one handling dust from the bag cleaners and sand-handling equipment, the dust from which must be discarded. The other system collects dust from the screw-conveyor boxes and elevators, in which the stucco is not contaminated and this recovered material is put back into the system.

Shipping

The company owns two steam-operated lighters which deliver plaster to docks on Long Island, Manhattan and North River points. Trucks handle most of the material doing into the Bronx and Westchester County.

The location of the plant, on the threshold of the Bronx and the most accessible of any gypsum plant to Manhattan, has resulted in the establishment of an enviable business in the metropolitan area, based on the quality of its products and its superior service to the building trade.



Elevator and revolving screen in Cheticamp crushing plant.

Meet to Discuss Southwest's Foreign Trade Plans

On April 14-15, at Houston, Tex., there will be held a meeting of exporters, importers, transportation officials, forwarding agents, manufacturers, and other auxiliary foreign trade service organizations for the purpose of exchanging ideas, and discussing subjects designed to stimulate more interest in, and cause a more rapid development of, the foreign commerce of the Southwest. This will be known as the Southwest Foreign Trade Conference and sessions will be held in the Rice Hotel.

The states of Missouri, Kansas, Oklahoma, Arkansas, Louisiana, and Texas will furnish most of the delegates for this convention. Attendance is invited from other southwestern states, while attendance from several Latin American countries also is expected. Pamphlets in the Spanish language have been prepared and are being used to solicit foreign attendance.

Loaded train of crushed rock at quarry, Cheticamp.

An aerial view of the Fort Dodge, Ia., plant of the United States Gypsum Co. This is one of the few gypsum quarrying operations in existence.

Crushed Gypsum—Its Use as a Retarder in Making Portland Cement

By RAYMOND B. LADOO
Manager Industrial Sales, United States Gypsum Co.

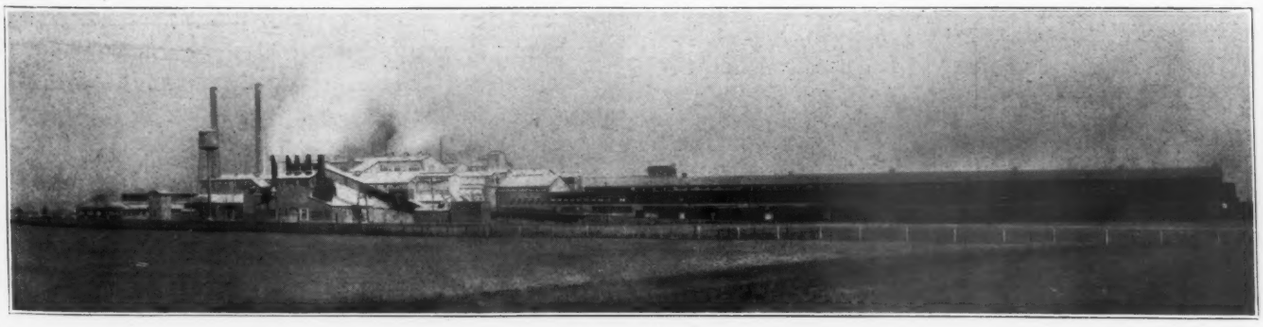
CRUSHED gypsum rock is used to retard the setting time and increase the strength of Portland cement. Portland cement is composed of a mixture of mineral ingredients containing lime (CaO), alumina (Al_2O_3) and silica (SiO_2), together with minor amounts of iron oxide (Fe_2O_3) and other oxides. The lime is usually furnished by high calcium limestone but it may be furnished by oyster shells, marl, marble, or iron blast furnace slag. Silica and alumina are supplied from clay or shale (consolidated, rock-like clay). Slag contains not only lime but also silica and alumina. Either limestone or clay is added to the slag to give the proper mixture. These ingredients are ground to about 85 to 90 per cent through a 200-mesh screen, either wet or dry, and carefully mixed together in exactly the right proportions. This mixture is then put into a long, rotary kiln, 7 to 11 ft. in diameter by 200 to 350 ft. long and burned at a white heat until the mixture just begins to melt and roll up into small balls, from 1/16 in. to 1 in. in diameter (sometimes up to 2½ in.).

These balls, known as cement clinker, are then discharged, still white hot, into a cooler where a water spray is often used to reduce the temperature, and then sent to the clinker storage. Sometimes it is necessary to grind hot clinker but this is bad practice and often results in quick-set cement. It should be at least quenched with water before grinding. Hot clinker is also much harder to grind than cold, seasoned clinker. If possible the clinker is allowed to cool and season for from a few days to several months.

The seasoned clinker (which is really the finished cement in lump form) is then taken to the grinding mills. Here the gypsum is added, just before the clinker enters the mill, by means of suitable mechanical feeders or by hand. The amount of gypsum varies with conditions, and with the purity of the gypsum. It usually varies from 9 lb. to 15 lb. per bbl. of clinker (1 bbl. equals four 94-lb. bags or 376 lb.), and averages about 12 lb. per bbl. (about 3 per cent by weight). This means that the finished cement contains from 1.5 to 2.0 per cent SO_3, average about 1.6 to 1.75 per cent SO_3. Thus it is obvious that with low grade gypsum (say 34 per cent SO_3) it is necessary to use much more gypsum than with high grade gypsum (45 to 50 per cent SO_3). Cement clinker itself contains some SO_3 (from coal, etc.), usually from 0.2 to 0.6 per cent, but for some unknown reason this has no retarding effect.

The maximum amount of SO_3 in ordinary Portland cement allowed by the American Society for Testing Materials specifications is 2.0 per cent. If a cement clinker naturally contains say 0.6 per cent SO_3 and it is necessary to add 1.2 per cent more to avoid quick-set, making a total of 1.8 per cent SO_3, it is obvious that great care must be taken in adding the gypsum and it must be of uniform quality. If too little is added quick-setting cement results, if too much the cement may be rejected for exceeding the specification limit.

The mixture of clinker and gypsum is first ground in primary grinding mills and then finely ground in finish mills, which are usually steel tube mills with steel balls or slugs as the grinding media. The finished cement, ground to from 82 to 95 per cent through a 200-mesh screen, is then taken to the storage silos and from there packed and shipped.



One of the largest gypsum plants of the U. S. Gypsum Co., located at Oakfield, N. Y.

The composition of a typical finished cement averages about as follows:

Analysis	Per cent
Lime (CaO)	63.0
Silica (SiO_2)	22.5
Aluminum (Al_2O_3)	6.5
Iron Oxide (Fe_2O_3)	2.5
Magnesia (MgO)	2.5
Sulphur Trioxide or Sulphuric Anhydride (SO_3)	1.7
Loss on ignition (water, etc.)	1.0
	99.7

Need for Use of Gypsum

Gypsum plays two roles in Portland cement. It retards the setting action and it is important as a strength producer. The latter function is not as well known and is not always recognized, but it is almost as important as the retarding action.

Portland cement has two separate setting actions, the initial set or the first hardening and stiffening, and the final set when it attains its final hardness. The two actions are quite distinct and are due to different causes. The final set usually takes place from 2 to 5 hours after the initial set. The maximum strength, however, is not usually reached for several weeks or even months after the final set.

As cement is made under modern conditions the initial setting time would be from less than a minute (so-called "flash-set") to say thirty minutes, without the use of gypsum. The A. S. T. M. specifications call for a minimum initial setting time of 1 hour, but it is usual practice to retard the initial setting time to 2 or 3 hours. Some cements under certain conditions are slow enough setting naturally so that no retarder need be used. But the retarder is never omitted for several reasons; first, the slow setting action cannot be relied upon at all times; second, some cements may be slow setting when first made, but change to quick-set after storage for a few weeks; third, naturally slow setting cements do not have sufficient strength without gypsum.

Many cements containing insufficient SO_3 may have normal setting times, but still be unsatisfactory, due to low strength. SO_3 in some unknown way helps in developing the strength of the cement. For example in one case a cement with 0.8 per cent SO_3 had a normal setting time but the strength was below specifications, say only about 150 lbs. per sq. in. The SO_3 was raised to 1.6 per cent and the strength increased about 50 per cent, say to 275 lbs. per sq. in.

The trade today demands high early strength cements. To develop this early strength most cement producers are grinding their cement finer, (90 per cent through 200-mesh now is common), making a more active cement. This usually means a quicker setting cement and more SO_3 is needed to retard the set. But the added SO_3 in itself is of assistance in developing strength.

High-Grade vs. Low-Grade Gypsum

Gypsum rock for cement retarder, as used today, varies from 34 to 50 per cent SO_3. The common range is from 42 to 45.5 per cent SO_3. Since cement companies are really buying SO_3, not gypsum as such, it is evident that they are interested (or should be) in getting the most SO_3 for their money. Many companies, however, have not recognized this and have bought their gypsum only on price, regardless of SO_3 content. Each per cent of SO_3 delivered is worth, at present prices, on an average, about 10 cents. So it is evident that higher SO_3 means eventually lower cost to the user if the price per ton is the same.

One of the arguments used in favor of low grade (low SO_3) gypsum is as follows: It is said that gypsum costs less than finished cement and each ton of gypsum is finally sold as cement, so the more low grade gypsum they use the more cement and more profit they make.

This line of reasoning is wrong, because the gypsum is added to the clinker and must be ground, handled, stored, packed, loaded and sold just as the clinker is. Really the delivered cost of gypsum should be compared with the cost of clinker, not of cement. Even this comparison is not fair, for each ton of gypsum does not make a ton of cement.

Gypsum loses about 1/5 of its weight in the clinker grinding process; so the gypsum cost (including cost of unloading from cars, storage, transporting to grinding mill and feeding) must be multiplied by 5/4 before comparing with the clinker cost. Clinker costs vary greatly, from say $0.35 to $0.80 per bbl. (376 lbs.), but probably average under $0.50. As there are 5.32 bbl. per ton, this corresponds to a gypsum cost of $2.66 per ton or about $2.00 per ton delivered after correcting as above. Practically no gypsum is delivered today as cheaply as $2.00 per ton. So it can be seen that this argument rarely holds good.

If the gypsum is really cheaper than the clinker the argument is fair. But what it amounts to is this: The cement company is adulterating its cement with inert material like its own clay or limestone and paying the gypsum price for it. If an adulterant is wanted local clay or limestone is more cheaply available at any cement plant. Adulteration of cement, however, is today not considered advisable.

But there is one partly valid argument in favor of using low grade rock. The more gypsum that is added the more pieces of rock there are, and, theoretically, the more uniformly will the SO_3 be distributed throughout the cement. This is partly true if antiquated gypsum feeding methods are

used. But with the fine crushing and close sizing of gypsum used today, very little trouble is experienced in handling even 50 per cent SO_3 rock.

Plaster Molds as Retarder

Some cement companies have tried to use discarded pottery or terra cotta plaster molds in place of rock gypsum, but in almost every case the experiment has ended in trouble and dissatisfaction after a few months. The reasons for failure are as follows:

1. Cement companies usually have to do their own crushing and use fines as well as coarse.
2. Crushed molds are hard to store and reclaim and are very dusty to handle.
3. Molds often contain iron reinforcing which has to be stripped out by hand.
4. Molds from casting shops sometimes contain free alkali and other soluble salts which interfere with the setting of the cement.

Use of By-Product Gypsum

Finely powdered, precipitated gypsum is obtained as a by-product in large quantities in several industries, notably in acidphosphate fertilizer manufacture. From time to time efforts are made to sell this to cement companies for retarder, but no cement plant has ever agreed to use it commercially. The troubles with by-product gypsum are:

1. It usually contains free phosphoric acid or other active chemicals which interfere with the setting of the cement.
2. It is in the form of a fine powder which, either dry or damp, is hard to store, handle and feed.
3. It cannot be obtained cheaply enough to offset the disadvantages and added cost of handling.

Standard Sizes of Crushed Gypsum

Standard rock gypsum sizes are about as follows:

No. 1—½ in. to dust, all fines left in. Made from undried rock.

No. 2—1¼ or 1⅜ in. to ½ in., all fines removed. Made from undried rock.

No. 3—1¼ or 1⅜ in. to dust, all fines left in. Made from undried rock.

No. 5—¼ in. to 10 mesh, not over 15 per cent through 100 mesh. Made from dried rock.

While these are standard size specifications, the various conditions and methods of manufacture result in minor local deviations from the standards. Thus No. 2 rock in some cases is 1⅛ in. maximum size and in others 1⅜ in., depending on local conditions and the needs of the trade. In a few cases special sizes, such as 1 in. to ¼ in. fines removed, are made to order, but such special sizings usually result in a higher price.

No. 5 size rock is always shipped in box cars and usually Nos. 1 and 3. No. 2 size is usually shipped in open-top cars, but sometimes in box cars, depending on customers' requirements.

Some of the common causes for crushed rock complaints are:

1. *Sizing of rock.*

a. *Too coarse.* Coarse pieces of rock will clog many automatic feeders, stopping the flow of gypsum into the clinker grinder and, thus, often causing quick set.

Trouble is usually due to improper screening at the mill or to carelessness.

b. *Too fine* or *too many fines.* The No. 2 size of screened rock should be practically free from true fines (1/16 in. to dust), but sometimes due to poor screening, damp rock, or other causes, the rock contains a large amount of dust. Fines, when damp, are sticky and pack together clogging bins, spouts and feeders. When very dry, fines flow almost like water and flood out through gates and feeders in an uncontrollable stream. Some cement plants want fines and others do not object to them, because their methods of storing, handling and feeding are designed to handle this type of material.

c. *Rock not flowable.* All cement companies want and need a rock that will flow in a uniform, controllable stream through bins, spouts and feeders. Sizing is really secondary to this flowability factor. Plants do not complain of fines until or unless they effect flowability. The things which effect flowability are fines (damp or very dry), too coarse rock, and presence of foreign matter such as sticks, burlap bags, etc.

2. *Quality of rock.*

a. *Too low SO_3.* In each district there are certain standards of purity of gypsum recognized by cement companies. These standards may or may not be written into specifications, but they are always understood. For example, in the Oakfield, N. Y., district 42 per cent SO_3 is the standard minimum.

Low SO_3 not only deprives the customer of material he has paid for, but it may also cause quick-set cement. If the SO_3 drops down and is not immediately caught by the cement chemist, too little SO_3 may be fed into the cement and quick-set may result.

b. *SO_3 not uniform.* Whatever the grade of the rock used the cement chemist expects the SO_3 content to be uniform, that is, not fluctuate from 41 per cent in one car to 45 per cent in the next. Theoretically, variations should not be over 2 per cent and preferably not over 1 per cent, but at present prices and with the manufacturing methods this is perhaps too rigid. A cement plant sets its gypsum feeder to deliver the correct amount of SO_3 based on a fixed gypsum analysis. If the rock varies very much the feeder must either be continually read-

justed or the SO_3 in the cement will be too high or too low.

Complaints of non-uniform SO_3 in rock may also arise from other causes. Non-uniform sizing of rock (rock too coarse or too fine) may cause automatic feeders to deliver varying amounts of rock, resulting in variable SO_3 in the cement. Improper working of feeders or carelessness in hand feeding may cause similar fluctuations. The gypsum may be uniform in quality and in sizing and the gypsum feeders may be working perfectly and yet variations in the SO_3 in the cement may result due to improper and non-uniform feeding of clinker. Complaints on gypsum rock often prove to be due to erratic clinker feeding rather than to any fault of the gypsum.

c. *Too high content of magnesia (M_gO), due to presence of dolomite in gypsum.* In some localities, for example in the Gypsum—Port Clinton, Ohio, and the Garbutt, N. Y., districts, the gypsum contains considerable dolomite (CaO. M_gO) CO_3 and the SO_3 is low (34 to 36 per cent). Dolomite contains 45.8 per cent magnesium carbonate (M_gCO_3) or 21.9 per cent magnesia (M_gO). Magnesia in excess is generally considered an injurious impurity in cement. The maximum allowed by cement specifications is 5 per cent M_gO. Cement companies sometimes complain that they cannot use a gypsum containing dolomite, or that a slight increase in the normal dolomite content causes them trouble.

On the surface this looks like a reasonable complaint, but, when the problem is carefully studied, it may be shown to be negligible. Assuming a 34 per cent SO_3 gypsum containing about 25 per cent dolomite, it may be shown mathematically that in normal cement practice not over 0.2 per cent M_gO is added to the cement from the gypsum. This is only 1/25 of the 5 per cent M_gO allowed by the specifications. This is so small as to be negligible and even large variations in the dolomite content of the gypsum can have very little effect.

When such complaints arise the true trouble is this. The major ingredient of cement is limestone and most limestones contain more or less dolomite or M_gO in some other form. For every ton of gypsum used in cement making 35 to 40 tons or more of limestone are used. When the M_gO in the cement runs high it is due to high magnesia in the limestone, not in the gypsum.

d. *High content of shale.* Shale is simply a rock form of clay, one of the ingredients of cement. When added to the cement clinker after burning, along with the gypsum, it is absolutely inert and has no effect good or bad. An excess of shale merely dilutes the gypsum and lowers the SO_3 as any other inert impurity would do. Complaints have arisen on this point, the cement company claiming that the shale had an injurious effect on the cement. This is not true. If there was enough shale to reduce the SO_3 content in the gypsum below the recognized standards for that district, they could justly complain of low SO_3, but not of actual damage to the cement.

e. *Anhydrite in gypsum.* Cement companies often used to complain, and sometimes still do, if even a trace of anhydrite is found in their gypsum. Other companies would allow a maximum of 5 per cent of anhydrite. The prejudice against anhydrite is now pretty well overcome in most districts but is still a source of complaint with a few companies. Anhydrite is really nothing but gypsum with the water of crystallization "squeezed out," and no one claims that the water in the gypsum is of any value as a retarder. This problem has been studied intensively for over three years, from every angle, in laboratories and in cement mills, and it has been clearly demonstrated that under cement mill conditions gypsum containing 50 per cent anhydrite is just as efficient as pure gypsum per per cent of SO_3 and much more efficient per ton (due to higher SO_3 content of anhydrite). It is believed that the anhydrite content could be increased to 60 or 70 per cent or higher and still get perfect results, but there are as yet no mill tests to prove this.

For over three years cement mills in New York, New Jersey, Pennsylvania, Maryland, West Virginia and Florida have been using Nova Scotia rock, containing an average of 35 to 40 per cent anhydrite with perfect results. Tests by prominent cement mill chemists have shown that hydrites from other sections of the country are equally as effective.

3. *Miscellaneous Complaints.*

Sometimes complaints are made that gypsum has caused quick-set cement, without laying the blame to any specific fault. Cement making is such a complicated and little understood process that troubles often occur which cannot be easily explained. In some cases quick-set trouble may be laid to the gypsum without justification or proof.

New Edition of Standard Work on Economic Geology

The sixth edition of the well-known volume, "Economic Geology," by Heinrich Ries, professor of geology at Cornell University, has recently come from the press of John Wiley & Sons, New York, N. Y. This work was published first in 1905 and was accepted as a text book in numerous colleges. It is used as an authoritative reference by practical engineers and operators in the mineral industry.

Lime and Cement from Gypsum with the Recovery of By-Products*

By OTTO F. HONUS

The recovery of by-products in industry often represents a considerable portion of the net return, especially in periods of depression. In this article, translated from the German, the author concludes a review of German patents, the first part of which appeared in the last issue, concerned with the manufacture of lime and cement from gypsum, together with by-product possibilities.

P. BAUD (see *Comptes rendues*, 1927, page 1140ff) describes a process for the decomposition of gypsum flour with the aid of aqua ammonia. Thus, 400 grams of gypsum flour are placed in a five-liter capacity agitating autoclave along with 350 cubic centimeters of aqua ammonia of 0.89 specific gravity, 70 grams of clay and 600 cubic centimeters of water, and carbon dioxide gas was led through the apparatus at a pressure of 0.75 atmosphere, which was found to be best suited for this purpose, and at a temperature of 48 to 70 deg. C. The treatment was allowed to last forty minutes. The various materials reacted with each other in such a manner that approximately 28 per cent of an ammonium sulphate solution of 1.16 to 1.17 specific gravity was obtained with 96.6 per cent sulphur yield. The clay-calcium carbonate mud should give a good grade of cement after being burned at a temperature of 1,550 to 1,600 deg. C.

Attention should here be called to the fact that the complete removal of the sulphuric acid residue from gypsum cannot always be effected without considerable difficulty. This circumstance forms more or less a problem in the technical solution of this matter. German Patent No. 380,621, which is assigned to the Rekordzementindustrie G.m.b.H., describes an important process for counteracting the sulphate residue in the raw cement mixture prepared from the gypsum or in the mixture obtained from burnt gypsum by the use of lead, this sulphate, so that the setting of the cement barium or strontium compounds to combine with is not retarded by too high a gypsum content.

As may be seen from what has been said above, there is today no lack of processes for the rational manufacture of lime, hydraulic lime, and portland cement along with sulphur compounds. When these processes are compared and contrasted with one another, it is found that in contradictinction to the limes and cement, which are manufactured from limestone alone or in combination with silica-containing materials, which limes and cements must also be burnt, and consequently require considerable heat energy, it is found that the gypsum-lime-cement and sulphur recovery processes possess not only a technical importance but are also of economic value as well.

Examples have been given above in which use has been made of the sulphur which is obtained as a by-product from the manufacture of lime and cement. Other methods are given below which are highly interesting and important to the cement and lime industry. For, in the first place, these processes are characterized by the fact that they afford a possibility of using the carbon dioxide that is produced during the manufacture. Carbon dioxide is contained in the waste gases from the kilns. Then again these processes yield calcium carbonate in such form that it is suitable for admixture with cement rock for the production of cement without it being necessary to grind the limestone before the mixing operation. The calcium carbonate that is obtained from these processes can also be compressed into the form of briquettes and then worked up into lime directly by burning these briquettes.

One of these processes has been patented by L. P. Basset in French Patent No. 331,897. According to this process, gypsum, mixed with coal and tar and formed into lumps, is burned in a retort. The resulting calcium sulphide is decomposed by the carbon dioxide gas, and the sulphuretted hydrogen which is obtained is burned, and the sulphur dioxide gas, which is the product of combustion, is converted into sulphuric acid by the regular process. Calcium carbonate remains as the residue.

Koehsel decomposes gypsum which has been reduced with carbon, hence calcium sulphide, with the aid of carbon dioxide gas, and then passes the gas through lead chambers for conversion into sulphuric acid.

Claus, Baranoff and Hildt in German Patent No. 104,186, heated gypsum with carbon or coal in retorts. The following reaction takes place, with the recovery of gases which contain as much as

* *Zement*, 1929, 1130-35.

ninety per cent of carbon dioxide gas, $CaSO_4 + 2C = CaS + 2CO_2$. These gases are allowed to act on calcium sulphide in the presence of water, with the result that calcium carbonate and sulphuretted hydrogen are formed according to the following equation: $CaS + H_2O + CO_2 = CaCO_3 + H_2S$. The sulphuretted hydrogen is passed into retorts, is heated to a red heat. The following reaction takes place at the start of the process: $3CaSO_4 + 4H_2S = 3CaS + 4H_2O + 4SO_2$. However, if an excess of sulphuretted hydrogen is present, then this acts on the sulphur dioxide and free sulphur is then formed in accordance with the Dumas reaction expressed in the following equation: $SO_2 + 2H_2 = 2H_2O + 3S$.

An improvement on the aforementioned process is the one patented by Dr. Bambach & Co. in German Patent No. 371,978. In this process the calcium sulphide, which is obtained through the reduction of calcium sulphate, is decomposed into lime and sulphuretted hydrogen by being subjected to the action of a suitably proportioned amount of steam in a part of the apparatus below the reaction zone. The sulphuretted hydrogen is subjected to oxidation and is converted into sulphur dioxide on its passage through the gypsum kiln. A shaft kiln is used in order to prevent the troublesome formation of sulphur. The shaft kiln is provided with a number of nozzles at different heights.

Seek Bauxite Substitute

Due to the high cost of manufacturing aluminous cements when a large proportion of bauxite is used in making up the mixture of raw materials, many experiments have been carried out in the effort to obtain cheaper raw materials for use in the place of the bauxite. This has actually been accomplished in part and there are several processes which will yield a molten cement or aluminous cement without the use of bauxite. Substances such as clay, which contains a large proportion of aluminous ingredients, the residues from the production of nitrogen from aluminum nitride, bog iron ore, limestones containing a high percentage of iron and alumina, as well as waste products from combustions of various sorts, such as the ash from lignite coal and anthracite and coke clinkers, have been used as substitutes for bauxite.

German Patent No. 407,373, which is concerned with the use of valueless bog iron ores and other iron-containing waste products, such as high iron limestones, clay slates as well as iron-containing fuels, describes a process of mixing these ingredients together to form a mixture in which the following relation between the ingredients holds good: $CaO/(SiO_2 + Al_2O_3 + Fe_2O_3)$ is equal to 0.8 to 1.2. This mixture yields a cement on being melted which has the following composition: 11 to 20 per cent of silica, 16 to 35 per cent of iron oxide, 8 to 16 per cent of alumina, and 45 to 55 per cent of lime. As may be seen from this analysis, alumina has been replaced to a large degree by iron oxide.

An Interesting Process

Another interesting process has been patented in German Patent No. 409,665 in 1923. The temperature in a producer which is fired with coke and which is used for the production of producer gas by the addition of oxygen to the air blast, is raised to such a point that it is possible to add sufficient limestone or materials containing limestone to the coke clinker so that the molten clinker contains approximately forty to sixty per cent of lime and enough alumina to counterbalance the silica content. The increase in the temperature is attained by adding to the air which is blown through the producer from 21 to 24 per cent of the so-called Linde air, this being rich in oxygen. The materials used in the process compose 442 parts by weight of coke, to which 12 parts by weight of granulated clinker and 27 parts by weight of limestone are added. The molten cement that is obtained in this manner has a specific gravity of 3.1 and is composed as follows: Silica 10.8 per cent, iron oxide 4.4 per cent, alumina 40.7 per cent, lime 42.8 per cent, sulphur 1.5 per cent, sulphur dioxide 0.30, and sulphur trioxide trace.

This cement was tested in the regular manner to determine its strength and the results were found to be satisfactory. Thus, standard samples were prepared for the determination of the tensile strength. The area which was tested was five square centimeters, while in the compression tests the area on which the pressure was applied was fifty square centimeters. The mixing ratio was 1:3. The tensile strength figures after 24 hours were 19.6 kilograms per square centimeter, after seven days 28.8 kilograms per square centimeter, after twenty-eight days 40.3 kilograms per square centimeter; the compression figures were after 24 hours 259 kilograms per square centimeter, after seven days 298 kilograms per square centimeter and after 28 days 346 kilograms per square centimeter. The strength properties of the cement can be changed by varying the proportions and the conditions under which the cement is made.

Attention is called to the important work done by Luftschitz and described in *Tonindustrie Zeitung*, 1924, number 53 on the aluminous cements and also to the work done by Natho (see *Tonindustrie Zeitung*, 1925, number 2, page 29) on the manufacture of aluminous cement from ashes. Natho starts with ashes obtained by burning lignite coal. The ashes had the following composition: combustible

matter 43.21 per cent, silica 1.59 per cent, alumina and iron oxide 18.72 per cent, lime 24.41 per cent and magnesia 3.38 per cent. When 46.77 parts of a mixture of alumina and silica (the mixture consists of 21.4 per cent of silica and 76.6 per cent of alumina) are added to one hundred parts of the aforementioned lignite ash, then a cement of the following composition is obtained: Silica 9.16 per cent, iron oxide and alumina 50.9 per cent, 34.9 per cent of lime, and 5.04 per cent of magnesia. It is claimed that the properties of this cement are very much like those of the French molten cements. Kaolin is used in minimum amounts to take the place of bauxite. Inasmuch as the lignite ash varies very markedly in composition, it is a very difficult matter to prepare cements which are uniform in composition and properties. The high iron content is also a difficulty of considerable importance. The result is the formation of a mixture of aluminate, ferrate and ferrite cements. These difficulties did not occur in the laboratory tests made in the preparation of the cement, but they are of considerable importance as far as the large scale exploitation of the process is concerned.

The fact remains that not all bauxites, particularly aluminum silicates which contain large amounts of iron, can be worked up into aluminous cements without considerable difficulty. This has been discussed in the article published by G. Agde and R. Klemm in *Zeitschrift fuer Angewandte Chemie,* 1926, volume 6, pages 175ff. These investigators were concerned with the determination of the suitability of Vogelsberger bauxite for the manufacture of cements. This established the chemical and crystallographic structure of the cements, formulated the conditions under which the portland cement should be made and attempted to explain the mechanism of the hardening process. The investigators used the results obtained by Endell and established the limits within which technical aluminous cements could be made by means of the triangular diagram. Graphical methods are employed and described in detail. The temperature that these investigators used in their experiments was 1,450 deg. C. They tried to convert the iron oxide into metallic iron by melting in the presence of a reducing agent, coke, the iron formed being removed by means of electro-magnets. In spite of all the effort spent in this work, the results were not good, as the strength figures obtained on the cements were poor. The most favorable strength in compression was 117 kilograms per square centimeter after three days, 166 kilograms per square centimeter after seven days, 186 kilograms per square centimeter after 14 days, and 194 kilograms per square centimeter after 28 days. The composition of the cement was as follows: 19.20 per cent of silica, 0.92 per cent of FeO, 45.53 per cent of lime, 10.79 per cent of Fe_2O_3, and 23.02 per cent of alumina.

Alumina Cement from Gypsum

More favorable results have been obtained from alumina cements prepared from gypsum. German Patent No. 310,070 (1917), F. Bayer & Co., Leverkusen, Germany, deserves consideration. According to this patent, calcium sulphate in admixture with silica, alumina and iron oxide, in which the proportion of iron oxide is greater than that of the alumina or takes the place of the latter, is heated to incipient or complete fusion. Thus the mixture is composed of 1 part by weight of roasted pyrites, 2.25 parts by weight of sand, and 13 parts by weight of anhydrite. This mixture is ground and heated to fusion either in the form of a mud or in the form of a powder in the rotary kiln or in the form of briquettes in the shaft kiln. Then the cement is quickly cooled and granulated. The gases that are obtained from this process are recovered and worked up into sulphuric acid. The molten product does not resemble an aluminous cement in any manner whatsoever, but is just a molten portland cement in which the proportion of iron oxide exceeds that of alumina.

A process which is suitable for the manufacture of aluminous cements and for the simultaneous recovery of sulphur dioxide is the one patented by G. Polysius Eisengieserei, Dessau, Germany, in German Patent No. 416,592, year 1924. Gypsum is used in this process in the place of lime or limestone. The sulphuric acid, present in the gypsum in the form of the sulphate radicle, is driven out by the addition of high grade bauxite. This is a matter of considerable significance from the practicality of the process, for the reason that the manufacture of aluminous cements is considerably reduced in cost due to the recovery of sulphuric acid. However, the use of bauxite for this purpose in the manufacture of aluminous cement cannot be avoided.

German Patent No. 437,242, which has been assigned to F. Krupp-Grusonwerke, Magdeburg, Germany, is interesting and valuable. This patent describes a process for the manufacture of aluminous cement. The required amount of alumina and silica for the production of a correctly constituted aluminous cement is obtained from aluminum silicates which contain a considerable proportion of silica. In this process the silica is converted into a volatile form by means of suitable reagents. This is accomplished by using fluorspar and sulphuric acid. Alumina and calcium sulphate are formed by the removal of silica. The alumina and calcium sulphate are then worked up in the known manner for the manufacture of alu-

minous cement with the recovery of sulphuric acid. Furthermore, fluosilicic acid is recovered as a by-product in the process. This process makes it possible to use other materials besides high grade bauxites in the manufacture of aluminous cements.

O. F. Honus in Czechoslovakian Patent No. 23,-829 proposes to mix together gypsum, which is rich in alumina, with bituminous shale, bog iron ore, clay or shale and also the residues that are obtained from the manufacture of sodium sulphide. This mixture is then melted in an electric furnace. A molten cement which has the following composition, namely, 11.05 per cent of silica, 39.90 per cent of lime, 42 per cent of alumina, and iron oxide, 1.75 per cent of magnesium oxide, and 3.10 per cent of calcium sulphate, is obtained when a gypsum containing 22.76 per cent of alumina and bituminous shale are used. Sulphur dioxide gas is recovered as a by-product from this process.

E. Schott of Heidelberg, Germany (German Patent Application No. 73,285/80b of 2/27/1925) obtains an aluminous cement along with the recovery of sulphur dioxide gas by melting anhydrite or gypsum without the addition of silica. Barium sulphate can also be used as one of the starting materials in this process.

Czechoslovakian Patent No. 24,765 of the year 1927, assigned to Honus, has for its purpose the manufacture of a mixed cement, which is high in alumina. The lime is partially replaced by barium oxide in this cement. Sulphur dioxide gas is simultaneously recovered. The aluminous cement which is obtained by this process, is characterized by the fact that it is made from gypsum which is rich in alumina and barium compounds which contain sulphur. The chemical composition of the cement can be varied at will by altering the ratio in which the raw materials are used. The chemical composition is as follows: 15.2 to 18.3 per cent of silica, 33.4 to 37.3 per cent of alumina and iron oxide, 24.60 to 29.60 per cent of barium oxide and 22.93 to 15.50 per cent of lime. The properties of the cement vary in accordance with the variation in the proportion of ingredients.

Technologic Information on Gypsum and Lime Cement

(*Continued from page 40*)

water at the time of its ultimate consumption, no more heat is evolved in such secondary slaking.

Lime Setting

The setting of lime cement (slaked lime) is due largely to ordinary drying, according to general belief. However, to some extent, the setting is attributable to the absorption from the atmosphere of carbon dioxide, with the alteration of the calcium oxide to calcium carbonate. Laboratory experiments have proved that the hardness and quickness of the set are materially improved in artificial atmospheres of this gas.

Pozzulan Cement

Slaked lime possesses an interesting property that is utilized commercially in what is known as pozzulan (or pozzuolan) cement. This cement gets its name from the volcanic ash of Pozzuoli, this material being the first that was used in the manufacture of this type of hydraulic cement.

In the presence of water, lime will combine with silica to form a calcium silicate similar to that which forms in portland cement when setting. The reaction is most pronounced if the silica, in powdered form, be present at the moment that the lime is slaked. The silica may be a component of slag, pumice, trass, siliceous earths, or even sand. The siliceous material should be ground intimately with the quicklime before the addition of water.

The addition of these active siliceous materials as a means of increasing the strength of cement and to render it water-proof has been carried to an extent that makes the term pozzulan signify a sort of concrete in which not only has crushed lava or crushed slag been utilized with the foregoing function but also in coarser sizes as the aggregate.

Compound Cements

In recent years numerous well-known brands of quick-hardening cements or plasters have been made by mixing definite proportions of quicklime and plaster of Paris. It is stated that the addition of 5 per cent of plaster of Paris to ordinary lime will improve its hardening property fully 50 per cent.

More Birth Stones

In a recent issue of *The Bulletin of the Delaware and Hudson Company* there appeared a list of the birth stones generally associated with each of the months of the year. Some one with nothing better to do has thought out a new list which is intended to fit the stone to the occupation of the person in question and it is perhaps more appropriate than the previous collection of costly gems. The new list is as follows:

For laundresses, the soapstone;
For architects, the cornerstone;
For cooks, the puddingstone;
For taxi drivers, the milestone;
For grouches, the blue stone;
For Irishmen, the blarneystone;
For borrowers, the touchstone;
For pedestrians, the pavingstone;
For stockbrokers, the curbstone;
For shoemakers, the cobblestone;
For burglars, the keystone;
For tourists, the Yellowstone.

Plant in Kansas Has Produced Keene's Cement for Forty-One Years

By JOHN C. BEST
President, Best Bros. Keene's Cement Co.

THE Best Bros. Keene's Cement Co. was organized in 1887, by the two brothers, William C. and Thomas J. Best. The writer hereof is the son of William C. Best. Frank E. Knight is treasurer and R. A. Nixon is secretary of the company. The first carload of Keene's cement to be made in America left this company's mills at Medicine Lodge, Kansas, in 1889.

While the concern is one of the oldest gypsum producing companies in the United States in point of continuous operation under the same management, its three mills at Medicine Lodge and the quarries at Sun City are thoroughly modern in all respects. Practically all buildings are of brick or concrete construction with steel sash and doors, steel-truss roofs, and electrically operated machinery. During the past four years the company has spent $350,000 in bringing the plant up-to-date and installing equipment not merely for labor saving and larger production, but for controlling and recording the various processes and standardizing the different grades of material manufactured.

Quarries at Sun City

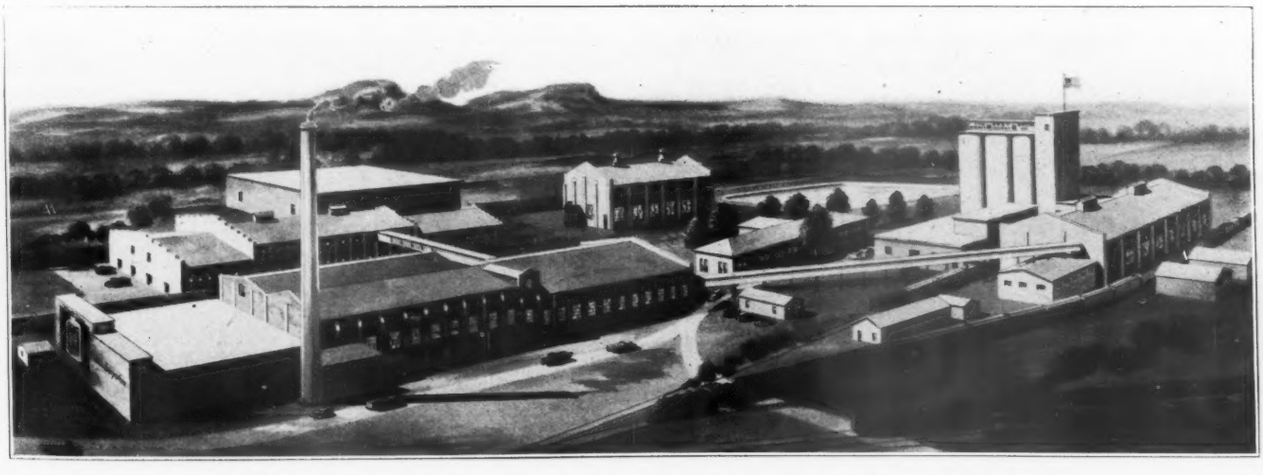
The quarries from which the raw material is obtained are at Sun City, some miles west of Medicine Lodge. The company owns, at that point, a tract of land three miles in length, on which the proved deposits of gypsum exceed 20,000,000 tons. It has another tract of similar extent about five miles further west, and a smaller tract nearer the mills. The supply of rock is practically inexhaustible and of the highest quality. Analyses made at the quarries frequently show impurities of less than 0.25 per cent, whereas gypsum rock is usually considered of very high grade if it contains less than 3 per cent impurities.

The quarries are operated by the open-strip method. The overburden is removed by gasoline shovels and dump trucks. The rock is then drilled with Plymouth electric drills manufactured by Howells Mining Drill Co. and Ingersoll-Rand air drills. Four of the Plymouth drills are mounted on tripods for bench holes, and two of them are small units used for pop shots. Du Pont's explosives are used throughout for the blasting.

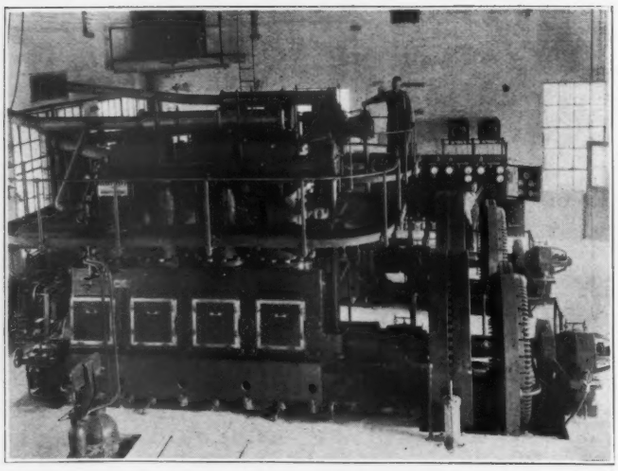
Four pits are operated at Sun City and all power is furnished from a central power-house containing Fairbanks-Morse and Anderson semi-Diesel engines. The electrical equipment was made by the General Electric Co. Current is generated at 440 volts, a.c., and stepped up to 2,200 volts for transmission to the various pits. In addition to the power-house, the company has at Sun City its own private telephone system connecting the various buildings and pits, and about four miles of railroad track which is served by 5 locomotives and 70 cars.

Crushing

After the rock has been blasted, it is broken up into a suitable size for handling, and loaded on quarry cars for transportation to the crusher house. Brookville locomotives are used for the pit switching, and Plymouth 8-ton locomotives for the line haul. On arrival at the crusher house the rock goes through primary and secondary crushers made by Butterworth and Lowe, and is then either run into steel storage bins, or into



General aerial view of Medicine Lodge plant of Best Bros. Keene's Cement Co.



Two Diesel engines direct-connected to generators in power house at Medicine Lodge.

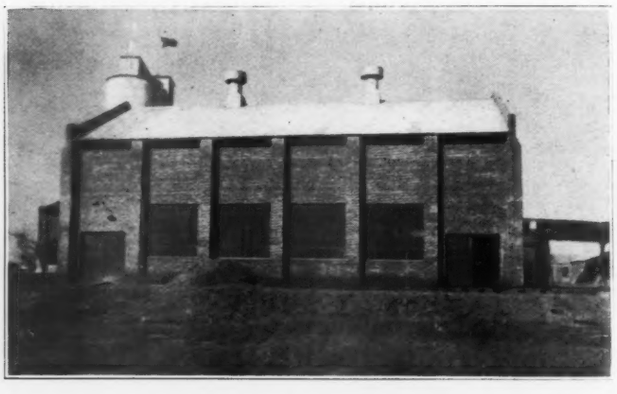
aerial tramway buckets which take it across the valley and the Medicine River to the railroad siding one and one-half miles away. A Leschen aerial tramway is used for this purpose, having a capacity of 40 tons per hour.

From this point the rock comes down over a short haul on the Santa Fe Railway to the mills at Medicine Lodge. The Medicine Lodge plant consists of three modern mills, three large storage buildings, a central power plant, the general offices and laboratory, a well-equipped machine shop, and several smaller buildings. All machines are operated on electrical drives, with individual motors, remote control, and approved safety devices.

The central power-hour contains two McIntosh and Seymour Diesel engines of 675-hp. direct-connected to General Electric 440-volt, a.c. generators. It not only furnishes power, light, compressed air, and heat throughout the plant, but is also tied in with the utility company serving the local territory and, in an emergency, has several times furnished the entire current requirements of six or eight cities within a thirty-mile radius from the plant.

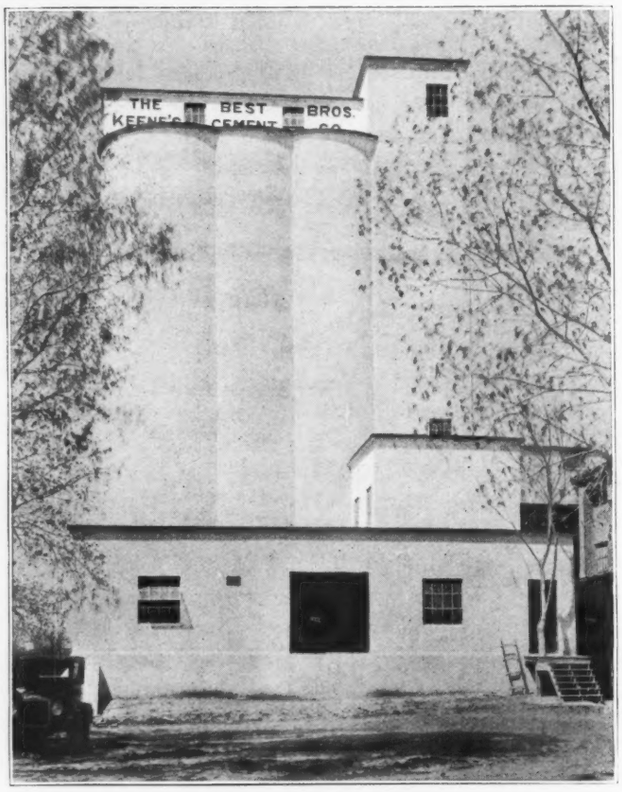
Mills at Medicine Lodge

On reaching Medicine Lodge from the quarries, the rock is unloaded in a track hopper having a capacity of 60 tons per hour and conveyed into a raw storage building, is divided into four sections and holding 5,000 tons. From this building it is fed into three Vulcan rotary kilns, 8 ft. by 125 ft., where it is calcined at a much higher temperature than anything else used in the treatment of gypsum products. The calcined rock then passes through rotary coolers and is run into storage until needed.



Central power house, from south.

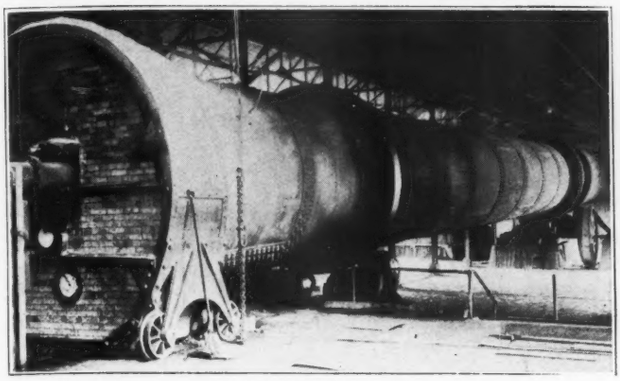
The grinding and chemical treatment of the material takes place in Mills No. 1 and No. 3. The more finely ground products are made in Mill No. 1, where Raymond mills are used. The coarser grinding is done in Mill No. 3, where Sprout,



Reinforced-concrete storage tanks and sacking room.

Waldron and Co. 36-in. Monarch vertical burrs and Broughton mixers manufactured by Dunning and Boschert Press Co., are used. With the exception of one or two special lines, all products are put out in multi-wall, paper valve-bags using the Bates valve bagging machine.

Storage facilities are provided at the plant for 5,000 tons of raw material, 1,000 to 1,200 tons of semi-finished material, and 3,000 tons of finished products ready for shipment. The plant is served by four private switch tracks totally over 2,000 ft., so that, both from the point of stocks on hand and shipping facilities, the company is in excellent position to handle promptly a large tonnage of business. The company employs about 200 men, exclusive of salesmen, and maintains branch offices in several of the larger cities. The reinforced-con-



Rotary kiln of type used in Best Bros. Keene's cement plant.

crete storage silos were built several years ago and were the first tall, circular tanks used for the successful storage of calcined gypsum.

Best Bros. Keene's cement has been used in this country for more than 40 years and, in that time has entered into the construction of thousands of the finest buildings erected during that period. Formerly its use was confined largely to bathroom tiling, artificial marble, ornamental plastering and hard white finish; but during the past decade it has been used in large and increasing quantities for base-coat work. Best Bros. Keene's cement is generally recognized as the ideal gauging material for lime mortar and is employed for this purpose by most of the ready-mixed mortar plants that are now doing such a large volume of business in different sections of the country. It is also widely used in the production of colored interior finishes.

Keene's cement differs from hard-wall plaster in that it has a higher tensile strength, can be retempered without injury after it has started to set, and can be kept in storage for ten years or even longer without any deterioration.

In addition to Best Bros. Keene's cement, the company also makes high-grade casting, molding, finish and gauging plasters under the brand name "Pioneer."

Cement Dermatitis — Cause and Proper Treatment

Workers engaged in handling portland cement, both in cement mills and on construction and other work in which cement is used, sometimes suffer from skin burns and eruptions known as cement dermatitis. This condition is caused by the irritating effect of the lime which the cement contains, by the clogging of the pores of the skin by hardened particles of cement, and by the chafing and cutting action of the hard grains against the skin. Workers seem to suffer more from this eruption in the summer time, probably because sweating increases the action of the cement on the skin.

Cement dermatitis starts as an itching rash somewhat like eczema, and the sores often become swollen and infected. Persons with tender skins are more subject to it than those whose skin has become hardened. The eruption usually occurs on the hands and arms, although it may appear on any part of the body.

The best method of preventing cement dermatitis is frequent bathing. The hands and forearms particularly should be washed thoroughly and often with plenty of warm water and soap, to remove the cement completely from the pores and surface of the skin. Wash rooms with hot showers should be provided in cement mills, and ample washing facilities should be made available on outside jobs.

It is also advisable to cover the hands and arms with a coating of a suitable ointment to replace the oil in the skin and keep it from cracking. An ointment composed of 3 parts of vaseline to one part of lanoline is suggested.

Protective clothing is an effective precaution. Gloves of rubber or strong, closely-woven fabric should be worn wherever possible. Workers in wet concrete should be equipped with rubber boots. Outer clothing should be of closely-woven fabric and should fit tightly at the wrists and ankles. Clothing should be kept dry and should be washed frequently.

The A B C of Safety

A is for Accident, a good thing to shun.
B is for Bandage, "A" calls for one.
C is for Careful, at work or at play,
D is for Do what the Safety Signs say.
E is for Emergency, you must act in a hurry,
F is for Forethought, it saves you much worry.
G is for Goggles, they sure save your eyes,
H is for Helmets, you'll wear if you're wise.
I is for If, the Victim's excuse,
J is for Judgment, it sharpens with use.
K is for Knowledge, it pays in the end,
L is for Luck, on which you cannot depend.
M is for Misery, each accident brings,
N is for Now, that's the time to do things.
O is for Orphan, your death leaves behind,
P is for Poverty, harsh and unkind.
Q is for Quickly, a very good bet,
R is for Reckless, the Hospital's pet.
S is for SAFETY, the greatest of all,
T is for Tears, your family lets fall.
U is for Useless, if you don't obey rules,
V is for Vicious, that's block-heads and fools.
W is for Waste, of time and life,
X stands for Crossing, where danger is rife.
Y is for YOU, will you do your share?
Z doesn't rhyme, so we'll just leave it there.

—By Jim Halihan, in General Petroleum Corporation's *Doings in General.*

Single-Unit Hydrated Finishing Lime Plant has 40 Kilns in Lime

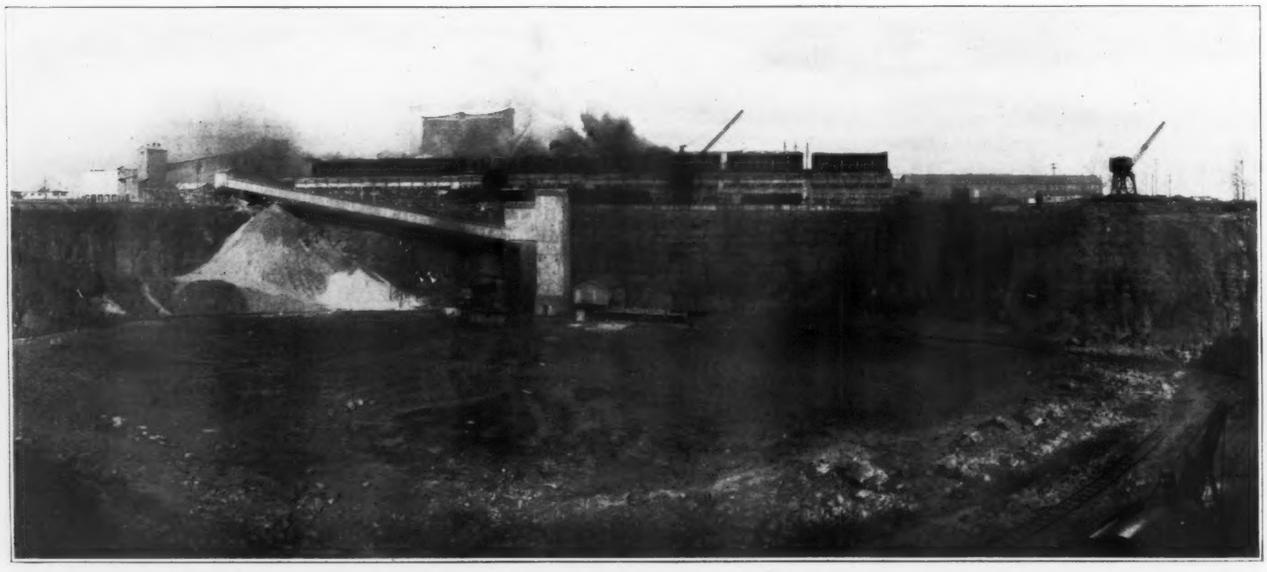
Genoa, Ohio, Plant of U. S. Gypsum Co. Largest of its Type in North America

GENOA, OHIO, and vicinity has long been noted for the high quality of its limestone. As long ago as 1860, lump lime was produced in this section. Many years ago it was found that this limestone possessed a peculiar property, namely—that when burned it could be slaked at the plant and shipped in dry powdered form and that this powdered lime when again mixed with water, did not lose the peculiar slip necessary to a finishing lime, as would be the case with ordinary limestone. A quarry at Genoa, having noted this property of the Ohio limestone, claims the distinction of being among the first to make hydrated lime in this country. The process used was primitive, consisting of turning the hose on the lump lime and screening out the hydrated lime which formed on the cooling floor. This old quarry, now abandoned, is within half a mile of the United States Gypsum Co.'s plant.

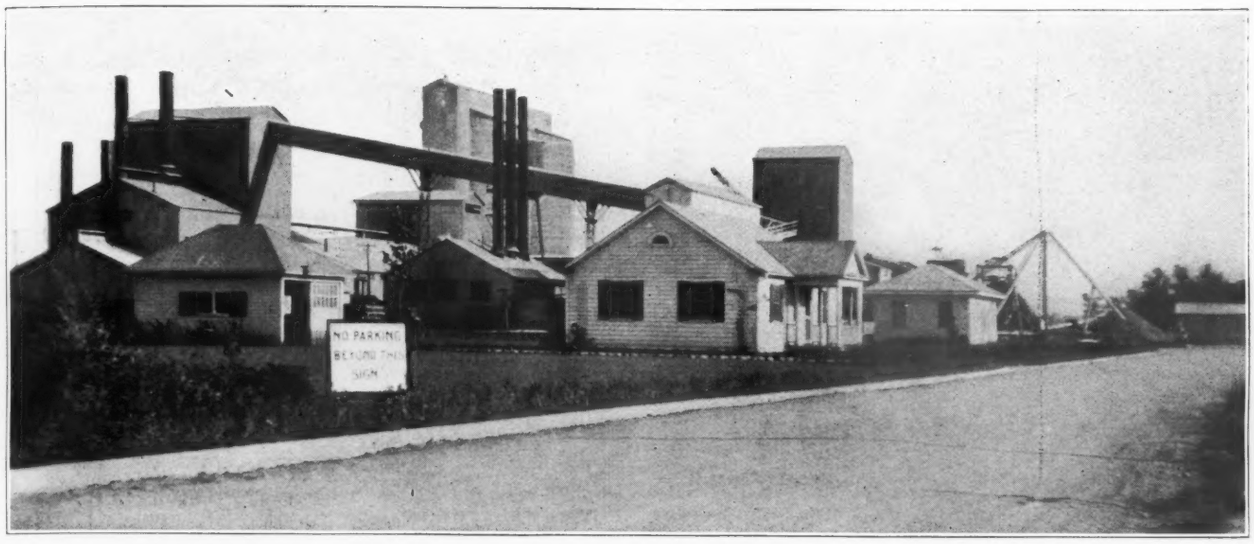
In 1914 the United States Gypsum Co. decided to go into the lime manufacturing business. The company already was in the lime business in a jobbing way, shipping lime in mixed cars with gypsum plaster, the two products taking the same freight rate; and it was believed by the management that the introduction into the manufacture of lime of the quality control methods practiced in the manufacture of gypsum products would be a service to its dealers. Accordingly the company's geologists made an extensive survey of centrally located lime properties. At Genoa, Ohio, they found the ideal lime deposit—an outcropping of true dolomite rock, over 99 per cent pure and extending to a depth of more than 200 feet. This property was acquired in 1915.

In the same year a nine-kiln plant was constructed, the plant, as today, being entirely devoted to the manufacture of lime in hydrated form. The company possessed an important advantage over most others who have started in the lime manufacturing business, in that they had a fully equipped mining and engineering department. As a result the quality of the lime was excellent from the very start; also, as the company was not obliged to do the usual amount of experimental work, costs were kept at a minimum.

In such great demand was this finishing lime from Genoa that within two years from the opening of the nine-kiln plant, the company was obliged to add eight more kilns, which were of similar design. In 1922 five more kilns were added; in 1923, five more; and in 1924, thirteen more, making a total of forty kilns. Finding these forty kilns inadequate to take care of the growing demand, the company three years ago installed two continuous process kilns, or rotaries, with capacity of approximately half that of the entire forty shaft kilns. The plant is said to be the largest single-unit



A view from the far edge of the quarry showing the entire plant layout. The crushing plant and conveying system for the rotary kilns are at left. Gantry cranes handle rock from quarry cars direct to vertical kilns.



The Genoa, O., lime plant of the U. S. Gypsum Co. with the rotary-kiln mill in the foreground. In the background are the two concrete storage silos and the vertical kilns.

hydrated finishing lime plant in the world, and is also unique in the number of shaft kilns in line.

Up to 1929 the rock, after being shot down, was loaded by hand. In that year the company installed mechanical equipment for recovering the rock, consisting of Bucyrus shovels and conveyors and elevators leading to the rotaries. Because of the location of the plant with relation to the quarry and the sheer quarry face, it is possible for gantry cranes to pick up the buckets of rock from the quarry floor and deliver them directly to the stack kilns. At the start one gantry was employed, the number being later increased to three, two Orton and Steinbrenner and one Link-Belt, with 50-ft. booms. These gantries, which straddle the tracks, are equipped with trips, operated by the crane operator, and each crane delivers about two tons at a time through the top of the stacks.

The present method of reclaiming the limestone is as follows: After the overburden of soil and glacial boulders, which is from two to ten feet deep, has been removed by a Bucyrus 50-B stripper with a 1¾-cu. yd. bucket, holes are drilled with Clipper 5-in. well drills to a depth of 80 feet. The holes are then loaded with quarry gelatin, which is exploded with Cordeau Bickford, the size of the charge depending on the location and the condition of the face.

At the time of opening the quarry a 40-ft. bench was employed. The 20-ft. bench was later started, increasing the quarry depth to 60 ft. At present the entire face of the quarry is worked at one operation.

The loose rock is picked up by a 100-B Bucyrus with a 3-cu. yd. bucket, electrically operated, and loaded into Easton pan-type all-steel dump cars of 8-cu. yd. capacity each, which, by means of a gas locomotive, are conveyed to an Allis-Chalmers 42-in. gyratory crusher. After crushing, the limestone is screened by a Galland & Henning rotary screen, 72-in. diameter and 16-ft. long. It is graded into shaft-kiln rock, rotary-kiln rock and fines, the fines being conveyed to another screening plant where they are separated into road-stone, concrete, and ballast-stone sizes.

The shaft kilns are fired with coal and have a capacity of 15 tons each per day. They are of the company's improved design, and are equipped with pan conveyors for handling the lime with a minimum of labor.

The rotaries also are of the company's own design. Heat is furnished by producer gas. The kilns are lined throughout with refractory brick and the cold end is specially insulated. These kilns are equipped with Erie City waste-heat boilers, which furnish all the steam power for the plant.

After being burned, the lime is sorted and conveyed to swing-hammer crushers, where it is reduced to a satisfactory size for hydration. It then goes to steel storage bins of catenary type, a separate bin being provided for the finishing quicklime and for the masons' quicklime. Two concrete silos are also used for quicklime storage.

The hydrating operation is done in three Schaffer continuous-type hydrators. The hydrators are equipped with the Schaffer poidometer, a device which automatically weighs the lime and supplies the correct proportion of water.

As most lime men are acquainted with the Schaffer hydrator, it will be described only briefly. The interior of the hydrator contains super-imposed pans, every other pan fixed to the outer shell of the hydrator and those between revolving on a central shaft. As the lime is fed in at the top, it goes first to the first revolving pan and then to the first stationary pan, being constantly agitated by plows as it passes through the pans. This process assures a positive mixing of the quicklime

Firing floor at Genoa showing some of the forty kilns.

with the water. By the time the lime reaches the bottom of the pan, it is thoroughly and uniformly hydrated and dried. The steam escapes through a stack at the top of the hydrator, and the interior is cooled by means of ventilators at the bottom.

After being discharged from the hydrator the raw hydrate is ground in Bonnot mills or Raymond mills, depending on the fineness and quality required. Screw conveyors and elevators deliver the finished hydrate to steel, catenary-type bins.

Packing is done by six 4-spout Bates packers. The hydrated products of the plant are four: Red Top finishing lime, Red Top masons' hydrate, Red Top agricultural hydrate, and Red Top spraying lime.

The plant is served by the New York Central Railroad, multiple tracks accommodating enough cars for a twenty-four-hour output. In addition to this plant the United States Gypsum Co. operates lime plants at Oakfield, N. Y., and Cordova, Ill., and furnishes lime from the Williams Lime Manufacturing Co., Knoxville, Tenn., and the F. W. Menke Stone & Lime Co., Quincy, Ill.

Portable Concrete Testing Machine Developed

Designed for testing concrete used in highway construction, a portable transverse testing machine which weighs only about forty pounds but is capable of exerting a force of 4,000 pounds has been developed by Prof. Herman C. Berry in the engineering laboratories of the Towne Scientific School, University of Pennsylvania.

The machine is unique in that it satisfies all technical requirements for strength and accuracy and at the same time is light enough to permit an inspector to move it readily from one job to another, thereby avoiding delay in the testing and subsequent opening of new concrete roads, according to Dr. Robert H. Fernald, Dean of the school.

"In a number of states, including Pennsylvania, contractors engaged in the construction of concrete roads are required by the state highway departments to make sample concrete beams and to test them after different periods of curing. These beams are made from the concrete used at the time the road slab is laid and are cured under similar conditions," Dean Fernald explained.

"It has been found that transverse tests on these beams are more indicative of the quality of concrete than compressive tests on six inch by twelve inch cylinders and, as a result, the transverse test has become so well established that it is now the only strength requirement incorporated in the road construction contracts in some states.

"A number of state highway departments have developed apparatus for making the transverse test but the majority of the machines used are cumbersome and some of them are even incapable of being moved from place to place. This difficulty has been overcome by Professor Berry in the development of the new portable tester.

"The new machine consists of an aluminum alloy frame having a fixed point bearing at one end, and a slightly movable point at the other end so as to prevent the introduction of restraining stresses on the tension side of the beam during loading.

"On this frame there is mounted a small hydraulic pressure cell, on one side of which is a flexible brass diaphragm 0.01 inch in thickness. This chamber is filled with oil and connected to a common pressure gage which is graduated to record the pounds of load on the diaphragm. A metal disc floats in this diaphragm.

"Bearing on the disc is a rotating shaft which is threaded at the upper end so as to raise and lower a cross member to which a similar cross member below the beam is attached by two links. This lower cross member is pulled upward by the links against the beam, thus exerting the necessary pressure.

"The reaction to the pressure exerted on the beam is transmitted to the diaphragm and hence to the gage which indicates the breaking load by a maximum reading hand. After the breaking load has been recorded the machine can be moved about twelve inches along the concrete beam, and a second, or check test, can be made.

"The ease with which the pressure can be brought to bear by the machine is evidenced by the fact that the rotating shaft can be turned readily by hand up to a point at which 350 pounds pressure is recorded. Beyond that point, the use of a light capstan bar is necessary, but little physical force is required to operate the machine even when the maximum pressure of 4,000 pounds is being exerted."

Recent Progress and Development in the Gypsum Industry in Canada*

Annual Output of Maritime Provinces Now Valued at Nearly Four Millions

By R. M. SANTMYERS
Mineral Specialist, U. S. Bureau of Mines

AT PRESENT large quantities of crude gypsum are being shipped from the Maritime Provinces of Canada into the United States to be calcined and further manufactured. At the same time, Canada is purchasing from the United States plaster and other gypsum manufactures for her own needs. Domestic production of manufactured gypsum products, however, is again on the increase, and smaller quantities of these products are now being imported into Canada; the reason for this condition, it is claimed, is that, up to the present, there has not been demand enough to warrant the erection of additional mills in that part of the country. It may be noted, however, that most of the larger producers of crude gypsum are owned or controlled by American capital, and that the phenomenal growth of the exports of Canadian crude gypsum is due to the increasing demand of plants strategically situated along the northern Atlantic seaboard.

The production of gypsum is one of the oldest industries in Canada, and in point of gypsum output Canada ranks third among the countries of the world.

Gypsum was discovered in the maritime provinces of Canada at a very early date, but there is no authentic record of production until about 1822, *when gypsum was mined on a small scale in Ontario. Since then the production has grown slowly but steadily to more than a million tons. In* 1928 *the output was* 1,205,846 *short tons, valued at* $3,622,007.

Nova Scotia, New Brunswick, and Ontario, for the early years, were the producing provinces. Manitoba entered the field in 1901, *and ten years later* (1911) *active operations were started in British Columbia.*

For the finer grades of white plaster, such as dental plaster, for which the Nova Scotia rock is admirably suited, and for all grades of finishing plasters, there seems to be a rapidly growing Canadian market. The increased demand for fireproof buildings and the extension of building operations throughout eastern Canada have increased the demand for gypsum plasters and other gypsum building materials. In order to meet this demand, new plants have been erected and existing ones enlarged and modernized. Increased railroad facilities have contributed greatly to this end.

The principal producing centers in the Maritime Provinces are the following: In Nova Scotia near Baddeck, Mabou, Ottawa Creek, Chetitamp, and Iona on Cape Breton Island, and near Windsor, Cheverie, Wentworth, and Walton in Hants County; in New Brunswick near Hillsborough in Albert County and at Plaster Rock in Victoria County. In Ontario, Caledonia is the center of the producing district; in Manitoba the production comes from the vicinity of Gypsumville, 170 miles north of Winnipeg; and in British Columbia gypsum is taken from the Falkland deposit, 40 miles southeast of Kamloops.

In Nova Scotia the gypsum deposits were discovered soon after the settlement of the province, but there is no authentic history of operations before 1779, and there are no available records showing the exact extent of the business done previous to 1883. The operators, principally farmers, quarried the rock and hauled it to the point of shipment by means of sleds in the winter and carts or wagons in summer. At the port, they either sold it to local traders or chartered a small vessel in which to ship it to the United States, principally to Lubec, Me. The ship's captain usually acted as the broker. When the ship arrived at the mills, he would sell the cargo for the best price he could get, and then ordinarily would use the money to purchase flour, oil, and other necessities for return cargo.

After the year 1883 the operations were placed on a better business basis. Contracts were made in advance of production for the sale of crude rock along the Atlantic seaboard of the United States. This business prospered, and before long attempts were made to manufacture gypsum products in Canada. Since home consumption was limited, gypsum products made in Canada had to be sold almost wholly across the border, and when, in 1890 and again in 1897, the United States in-

* Excerpts from U. S. Bureau of Mines Information Circular 6162. Statistics compiled by Irene Aitkens.

creased its duties on imports of such products, all the Canadian mills were closed except one small mill at Windsor, Nova Scotia, which for some years had been making selenite cement for home consumption. Manufacturing has never reached important proportions even in later years.

From 1861 to 1867, 25 ports in Nova Scotia were shipping gypsum produced from 12 counties. In 1908 six ports exported gypsum from three counties. Practically all the gypsum produced in the province today is shipped to the United States and comes from four counties, namely, Hants, Antigonish, Inverness, and Victoria.

Principal Districts

The gypsum in Nova Scotia is found in the lower Carboniferous measures in 52 district areas, and the deposits cover about 625 square miles. The chief producing center is in the vicinity of Windsor, in Hants County, but Cape Breton is furnishing a larger and larger output. In addition to Windsor, the principal centers are: Cheticamp and Mabou, in Inverness County; Ingonish, Baddeck, Iona, and Ottawa Brook, in Victoria County; Ingonish Harbor in Antigonish County; and Newport, Wentworth, Cheverie, Walton, and Clarksville, in Hants County. Most of these deposits are readily accessible, being situated either near tidewater or near railways.

Production

Gypsum was mined in Nova Scotia as early as 1829, but the quantity was quite small. Even in 1872 the province produced only 99,470 short tons, but in 1928 it produced nearly ten times that quantity or more than three times the output of all the rest of Canada.

Of the 972,211 short tons of gypsum produced in Nova Scotia in 1928, 682,186 tons or approximately 70 per cent, was mined at Windsor in Hants County.

The output in 1928 from the Windsor district alone advanced by 120,703 short tons, from an output of 561,483 tons in 1927 to one of 682,186 tons in 1928, a gain of approximately 21 per cent. At Cheticamp the production increased from 40,008 tons in 1927 to 58,736 tons in 1928, or 47 per cent; at Ingonish from 85,803 tons to 96,311 tons, or 12 per cent; at Cheverie, from 13,804 tons to 19,030 tons, or 38 per cent; but at Walton in Hants County there was a slump of 22,468 tons, from 112,485 tons in 1927 to 90,017 in 1928, or 25 per cent.

Cost of Production

The cost of production of crude gypsum in the quarries of Nova Scotia varied roughly from 70 cents to $1.75 a short ton during 1928, depending chiefly on the method of production, whether by hand or by machinery, and on the efficiency of the equipment. One of the largest gypsum companies in the province states that it costs them approximately $1.50 to quarry a short ton of gypsum, the 1928 average being $1.47 a ton. Another authority claims that the average cost of production amounts to 75 cents a ton at the mill plus 50 cents for crushing, or a total of $1.25 a ton. The average cost, however, for the production of crude gypsum in Nova Scotia is about $1.50 per ton.

Method of Production

All of the ten gypsum companies in Nova Scotia (including one branch quarry) operating in 1928, are large users of power, and with one exception they employ steam shovels for removing overburden. One of the largest uses a steam shovel for stripping, gasoline and electric shovels for loading, electric pumps for unwatering in the quarries, and electric power at the crushing plant. Another firm at Walton removes the overburden by steam shovel, uses a gasoline-operated portable air compressor with drills for boring and operates its crushing plant by hydro-electric power. At Cheticamp a crude-oil engine is used to drive the crusher, whereas a firm at Windsor operates its two quarries by hand but employs hydro-electric power in its calcining plant.

The rock from the quarries is conveyed to the crushing plant and storage sheds either by electric or steam locomotives or by belt conveyors if the quarries are located very close to tide-water. From the storage sheds the rock is shipped by boat to the United States or to the calcining plants. The loading of boats destined for the United States is done mechanically by power-driven belt conveyors which necessitates crushing the crude rock to convenient size. Certain American operators have contended that this crushing is in effect a step in the manufacturing process and that upon the importation into the United States such rock should therefore be subject to duty as a partly manufactured product.

Shipping and Handling

There are excellent facilities for water shipments of gypsum from Hants County, the center of the Nova Scotian gypsum industry. The Gypsum Packet Co. (Ltd.) of Windsor operates a gypsum fleet of four steamers. Three of these were put into operation in the spring of 1927 and one in the spring of 1929. Each ship has a capacity of about 6,200 tons of gypsum. The service is direct from Windsor to Boston, New York, and Philadelphia. These ships are loaded by conveyor belts and unloaded at ports of call by clamshell buckets having a capacity of about ten tons.

The methods of handling and packing the manufactured products follow closely those in use in the United States. Finishing plaster is packed in 245-lb. and 320-lb. barrels; hard-wall plaster in 50-lb. paper bags and 100-lb. jute bags; and dental

plaster in 200-lb. barrels. The manufactured products are mostly shipped to various points throughout the Dominion, though some shipments are made to England and South America.

Prices

Prices of locally manufactured gypsum products sold on the Canadian market vary according to quality. A Cape Breton firm receives $10 per ton for hard-wall plaster sold in paper bags, f. o. b. factory, and from $10 to $15 per ton for high-grade casting plaster. Some wall plasters are sold on the Montreal market for $10.05 a ton, and the white plaster is sold for $16.30 a ton, f. o. b. railroad cars.

That portion of the crude gypsum that is shipped into the United States to mills controlling the Nova Scotian quarries is billed at various prices ranging from $1.12 to $1.60 a ton for shipments from the Halifax district and from $1.50 to $2 a ton for those from Cape Breton.

Labor and Wages

Labor conditions in the gypsum industry of Nova Scotia are said to be satisfactory. There is no shortage of either skilled or unskilled workers. During the summer months the number employed is much larger than during the winter months when navigation stops and the quarries reduce their working forces or close down entirely. The larger companies employ more or less permanent working forces and the smaller quarries, to a large extent, employ farmers who work in the quarries at leisure times. In 1927 six companies out of eleven operated the year round, two worked nine months, two worked six months, and one three months.

The nine-hour day has been universally adopted by the gypsum companies in this Province. Although the workers are not unionized, wages are virtually the same in all districts. The lowest average rates, of course, obtain where the most efficient mechanical equipment is installed, as this reduces the percentage of skilled workers. Wage rates are determined chiefly by the wages paid in other local industries such as fishing and lumbering. Skilled men receive about 45 cents an hour, unskilled workers and laborers about 30 cents, and shovel operators and electricians 65 cents an hour. The hourly wages paid to foremen range from 50 to 55 cents. One firm states that it pays its skilled workers $4 for a nine-hour day, its unskilled hands $3, and its foremen $5.

A noticeable part of the population in the gypsum districts, especially in Hants County, is dependent on the gypsum industry for its livelihood. In 1928 there were 923 men engaged in the Nova Scotian gypsum industry, of which 685 or about 74 per cent, were in Hants County, where one firm alone employed 387 workmen. Of the total of 923 men employed, 665 were working in the quarries and 258 in the manufacturing and shipping branches of the industry.

Ontario

SINCE 1822 the gypsum industry in Ontario has had a varied history. Today, with advantages of manufacture, marketing, and a growing consumption of gypsum products, it is one of the most important of the nonmetallic mineral industries in the Province.

The largest manufacturer of gypsum products in Canada, the Canada Gypsum & Alabastine Co., Ltd. [now Gypsum, Lime & Alabastine, Ltd., Canada], is located in this Province. This company is a recent combination of the Canada Gypsum & Alabastine Co., the Ontario Gypsum Co. (Ltd.), the Nova Scotia Coal & Gypsum Co. (Ltd.), and the Toronton Builders' Supplies Limited. It has up-to-date plants at Montreal, Quebec; Caledonia and Lythmore, Ontario; Winnipeg, Manitoba; and Port Mann, B. C. It will also be a large producer of plaster of Paris, Keene's cement and lime at these and additional plants operated at Elora, Teeswater, and Paris, Ontario.

This company's supply of crude gypsum has been purchased in part from the Canada Cement Co., but its main supplies are from its own mines at or near Caledonia and from its quarry at Mabou, N. S.

The first mill built by the company at Caledonia was intended only for the crushing of crude gypsum rock, which was shipped to Paris for calcining. In 1910 construction of a plaster mill was undertaken at Caledonia and was completed in 1911. The shipping of wall plaster and plaster of Paris was begun in July of that year. In 1913 additions were made to the shipping room so that railway cars could be placed on either side of it.

The capacity of the mill is as follows: crushed crude gypsum for cement plants, 400 tons a day; calcined gypsum for plaster board, wall-board, and gypsum block and tile, 130 tons a day; and calcined gypsum for hard wall plasters of all kinds, 200 tons a day. The output of crude ground gypsum for land plaster is now small.

A recent development at Caledonia for structural gypsum is the manufacture of Insulex, a product poured in place for insulating walls, floors, roofs, and ceilings. It is made by adding calcium sulphate and aluminum sulphate, finely ground lime rock (having a high calcium content), and retarder to the calcined gypsum. Mixed with an amount of water equal to about one-half its bulk,

the powdered Insulex swells to four or five times its original bulk. It sets in 20 to 30 minutes and since it retains its bulky structure, forms a highly efficient insulating medium.

Production

In 1928 the Canada Gypsum & Alabastine Co.'s operations in Ontario produced 85,811 tons of gypsum of various grades, valued at $553,271, as against 83,998 tons, worth $500,688 in 1927. The grades in 1928 were as follows: Crushed gypsum, 120,675 tons; fine ground, 1,134 tons; calcined, 4,113 tons sold, and 59,869 tons consumed in manufactured products, such as Insulex, plaster board and Gyproc.

Manitoba

DEVELOPMENT of gypsum in Manitoba started in 1901, when the Manitoba Union Mining Co. staked out several claims and erected a small mill at Old Gypsumville on Lake Manitoba, 12 miles southwest of the present village. At that time there was no rail connection, and the calcined gypsum was shipped down the lake to Delta, whence it was distributed to consuming points. Later a track was laid from the quarries to the lake, so that gypsum could be delivered to the mill the year round. In 1904 the property was purchased by the Manitoba Gypsum Co. The mill burnt down in 1906, and a new mill was erected at Winnipeg. For a time the crude gypsum was shipped by barge down the lake to Delta, thence by rail to Winnipeg; but in 1910 the Oak Point branch of the Canadian National Railway was extended to Gypsumville, and shipments have subsequently been all by rail. The Manitoba Gypsum Co. which is still the only producer in Manitoba, was taken over by the Canada Gypsum & Alabastine Co., Ltd., in 1928.

Quarry methods at the deposit are simple. After clearing away the underbrush and removing the overburden by scrapers, a row of four holes, 4 feet apart and 4 feet back from the face, is put down to the level of the quarry floor. These are loaded with only a comparatively light charge of 60-per cent dynamite. The broken gypsum is loaded by steam-shovel directly into railway cars. Excessively large lumps are broken by hand in the cars. About 15 men are employed the year round. Shipments average 160 cars a month during the summer. More or less continuous pumping is necessary to keep the quarry dry. A more efficient drainage system to Lake St. Martin, which would permit considerably deeper quarrying, is a likely development.

New Brunswick

GYPSUM was discovered in New Brunswick in the district adjacent to the town of Hillsborough. Old excavations and small waste-dumps now covered by undergrowth indicate that they were worked at an early date. Prior to 1847, small shipments were made from time to time by farmers of the district. The gypsum was dug wherever it was easiest to obtain and was hauled in winter on sleds to the nearest shipping point on the Petitcodiac River. There it was purchased by masters of small coasting vessels who in turn, sold it to the calcining mills situated on the Atlantic seaboard of the United States. This business was profitable to the ship-owners because, had it not been for this cargo, the vessels would have had to return empty. Much of this gypsum went to plaster mills at Lubec, Me. About 1847 the company that owned these mills obtained mining rights to the properties in the Hillsborough district and soon succeeded in making shipments during the winter as well as throughout the summer. After producing never to exceed 3,000 tons for a number of years, this company transferred its mining rights in 1854 to a New York company, which erected a large plant, built a railroad from the quarry to the river, and constructed wharves for the accommodation of vessels. This new mill ran until about 1873, when it was destroyed by fire, however, it was replaced at once by a new plant, which came into operation in 1875. In 1876 the extension of the Intercolonial Railroad through this district provided facilities for shipping to Canadian consuming centers as well as to the United States.

An American company that formerly operated here somewhat extensively has not been very active in recent years. A Canadian company—the Albert Manufacturing Co., Ltd., the oldest operating company in this district—has a plaster plant at Hillsborough which is reported to have the largest kettle capacity of any plant in Canada. In 1925 the daily capacity was increased from 100 tons to 240 tons of plaster in 10 hrs. This plant is said to produce annually about 15,000 tons of hard-wall plaster and an equal quantity of finishing plaster and allied products. The company's trade-mark is Hammer Brand, and its goods are sold principally in Canada, though small quantities of finished products are exported to South Africa and Australia. The total exports of crude gypsum from New Brunswick average about 20,000 tons annually, practically all of which is shipped to the United States.

British Columbia

THE gypsum industry in British Columbia dates back only to 1911, when 780 short tons were shipped to Vancouver and Victoria for use in the manufacture of cement. Small quantities were produced in this Province in 1913 and again in 1917. From 1921 to 1925 minor tonnages—not over 325 tons annually—were produced and sold as land plaster for agricultural purposes. Not until 1926 did operations in British Columbia become at all extensive. In that year 20,916 short tons were shipped to cement plants in Vancouver, B. C., and Exshaw, Alberta. The British Columbia Gypsum Co. began operations in 1926 and commenced shipments from its quarry at Falkland to its mill at Port Mann. The calcining plant at Port Mann is equipped to manufacture all grades of gypsum plaster and to fabricate plaster board. This plant and the quarry at Falkland were taken over in March, 1928, by the Canada Gypsum & Alabastine Co. (Ltd.) of Ontario, which continued operations at nearly full capacity.

Statistical Summary

CANADA ranks third among the gypsum producing countries of the world, but as yet it is not a large consumer of this material. None of the principal outlets for gypsum—as a retarder in the cement industry, as agricultural land plaster, or as a source of calcined material for the local manufacture of gypsum products—has attained important proportions in the Dominion.

Gypsum deposits were discovered soon after the first settlement of the Maritime Provinces, and there is authentic record of production in Ontario about the year 1822. From this time on Canada's output has grown steadily but slowly until in 1928 it amounted to 1,205,846 tons having a value of $3,622,007. Even in that year, however, more than two-thirds of the tonnage was exported to the United States, much of it simply as crude rock.

For 20 years the percentage of crude rock has changed but little. Home consumption, though still relatively small, has managed to keep step with the export trade which has more than doubled within the past five years.

Production

Nova Scotia, the leading Province as regards both production and exports of gypsum, produced in 1928, 81 per cent of the quantity and 49 per cent of the value of the total production of the Dominion. While the output of Nova Scotia has been advancing by leaps and bounds, the production of New Brunswick, despite its relatively high unit value, has remained nearly stationary for the past 5 or 10 years. As compared with the period 1899 to 1907 it shows a decided falling off. This is due in great part to the energetic activities of certain American-owned companies in Nova Scotia. New Brunswick at present has only one active producer, the Albert Manufacturing Co., a Canadian concern. During 1928 the Province of New Brunswick produced 74,783 tons of crude gypsum having a value of $500,502, or 6 per cent of total quantity and 14 per cent of the total value of the gypsum produced in Canada.

In Ontario, which is practically self-contained as regards its production and consumption, the output though no longer growing has been well maintained; in 1928 it amounted to 85,811 tons valued at $553,271 or 7 per cent of the total quantity and 15 per cent of the total value produced in the Dominion. The entire Ontarian production of finished gypsum products is furnished by the Canada Gypsum & Alabastine Co. (Ltd.), a Canadian-owned company [now Gypsum, Lime and Alabastine, Ltd., Canada].

The production of gypsum in Manitoba, which started in 1901 with 600 tons valued at $7,800, has grown fairly steadily until in 1928 it amounted to 51,285 short tons valued at $609,039, or 4 per cent of the total quantity and 17 per cent of the total value for Canada.

Production of gypsum in British Columbia, which started in 1911 was more or less intermittent and of negligible quantity until 1926, when it jumped to 20,916 tons valued at $156,964. There is only one company operating in this Province which in 1928 produced 22,231 tons valued at $194,933, or 2 per cent of the total production and 5 per cent of the total value for Canada.

Consumption

Since 1920 the estimated consumption of crude gypsum in Canada is about 35 per cent of the average production, estimating an annual consumption of 250,000 tons and an average production of 721,000 tons. This consumption may be divided as follows: As agricultural fertilizer or land plaster, 7,000 tons annually, or 3 per cent of the total; as a retarder in the manufacture of cement, 36,000 tons or 14 per cent; and the remainder or 207,000 tons consumed in the gypsum products industry.

The use of gypsum for agricultural purposes in Canada is following the same trend as in the United States, much smaller quantities being used for this purpose than in former years. A conservative estimate would place the figure at 6,000 to 8,000 short tons annually. The cement industry, on the other hand, is taking increasing quantities of crude gypsum as a retarder for their product, and

as the cement industry expands, as it is bound to do, this use will increase.

Plant Location

The gypsum products industry in Canada is becoming of greater importance and has made rapid strides during the past ten years. The fabricating industry is concentrated chiefly in Ontario and obtains its raw material from that Province and from the Maritime Provinces, especially Nova Scotia.

There are two plants in Ontario at present, manufacturing all grades of calcined gypsum products. Practically all of these products are consumed within the Province; only small quantities are shipped into Quebec or exported to the United States.

Although Nova Scotia produces by far the larger part of the gypsum output in Canada, its local manufacturing industry is of little consequence, as there were only two fabricating plants in operation in 1928; however, it furnished considerable quantities of crude gypsum to manufacturing plants in Ontario and Quebec.

The production of crude gypsum in New Brunswick, Manitoba and British Columbia is practically all used in the gypsum products plants in those Provinces, small quantities being shipped in the crude state to cement plants for use as a retarder.

Exports

Canada is the largest exporter of crude gypsum in the world, shipping, in 1928, 824,536 short tons valued at $1,240,987; this represents 68 per cent of her total tonnage production. Although this tonnage seems large, the percentage exported is nevertheless somewhat smaller than in past years. During the 10-year period, 1890 to 1899, an average of 81 per cent of the total production was exported and during the next decade, 1900 to 1910, an average of 78 per cent of the total production was exported, but in the following 10-year period, 1910 to 1919, a decided decrease took place when only an average of 64 per cent of the production was exported. The period, 1920 to 1928, showed a slight increase, when an average of 66 per cent of the total production was exported.

Owing to the shortage of ships during and immediately after the war and because of other abnormal conditions, the average for 10-year periods are doubtless not as representative of the actual trends as data for five-year periods before and after this interruption. If we take the years 1909-1913, inclusive, as representing pre-war conditions for comparison with the present-day conditions as shown by the average for the five-year period, 1924-1928, we find that the increase in the percentages of exports has been only from 66 per cent to 68 per cent. Since both production and exports are now roughly twice as large as they were before the war, it is evident that Canadian home consumption has increased almost as fast as the export trade.

Imports

The imports of crude and calcined gypsum into Canada have varied considerably from year to year and follow fairly closely the tariff changes both in the United States and Canada. As compared with the production of crude gypsum or with the output of manufactured gypsum products they are relatively small and for this reason fluctuations are not particularly significant. During the past 10 years the imports of plaster of Paris have been generally on the increase, amounting to 10,563 short tons valued at $142,550 in 1928. The imports of ground crude gypsum likewise were the highest during the past 10 years, reaching 256 tons valued at $7,379 in 1928. Imports of crude gypsum, on the other hand, fell off considerably during this period, amounting to only 1,097 tons valued at $40,312 in 1928.

Developing Western Canadian Sodium Sulphate Deposits

Deposits of sodium sulfate occur in Western Canada in alkali lakes scattered throughout the undrained portions in the provinces of Saskatchewan and Alberta. A number of these lakes were drilled by the Mines Branch, Department of Mines, and over 115 million tons of hydrous sodium sulfate and other associated salts were proved to be present. Attempts have been made, from time to time, to develop these deposits and recent developments will most likely assure this industry being put on a sound economic basis. At the present time the Barium Reduction Corporation of Charleston, W. Va., is making extensive plans to operate a deposit at Horseshoe Lake near Ormiston, Sask. This company, operating under the name of the Horseshoe Lake Mining Co., is installing an extensive plant to harvest and dry the crystals as found in the lake, and hopes by June, 1930, to be in a position to operate at the rate of 25,000 tons of dried materials per year. A contract has already been signed with the International Nickel Co. to ship this material to Copper Cliff, where it will be treated with sulfuric acid to make the acid sulfate needed for the refining and separation of copper and nickel. When this plant is in operation the production from these lakes will show a decided increase.

The deposit at Dunkirk, Sask., operated in the past by the Bishopric & Lent Co. of Cincinnati, Ohio, had the misfortune to lose its mill by fire in 1929. A new plant is being built.—From *Mining and Metallurgy.*

Mississippi Valley Cement Mill Workers Talk Safety at Two Meetings

Regional Gatherings Held at Des Moines March 18 and at Kansas City March 25

TWO regional safety meetings, part of the schedule arranged this year by the Portland Cement Association, were held in the Middle West within the last few weeks—on March 18 at Des Moines, Ia., and on March 25 at Kansas City, Mo. Large attendances and worth while talks on accident-prevention subjects characterized both gatherings.

Seven of the fifteen Portland Cement Association's regional safety meetings planned for this year have been held to date. According to A. J. R. Curtis, assistant to the general manager of the association, more enthusiasm has been shown at this year's meetings than at any previous gatherings. This enthusiasm should be apparent in the annual June No-Accident campaign in which approximately 160 cement mills throughout the United States will participate and make a concerted effort to be without a single mishap during the month.

The annual meeting of the region embracing Iowa and Minnesota comprised three sessions that were held March 18 at the Hotel Fort Des Moines, Des Moines, Ia. Seven cement plants participated in the meeting: Dewey Portland Cement Co., Davenport, Ia.; Lehigh Portland Cement Co., Mason City, Ia.; Northwestern States Portland Cement Co., Mason City and Gilmore City, Ia., plants; Hawkeye Portland Cement Co., Des Moines, Ia.; Universal Atlas Cement Co., Duluth, Minn.; and Pennsylvania-Dixie Cement Corp., Des Moines, Ia.

W. H. Klein, general manager of Pennsylvania-Dixie Cement Corp., presided at the forenoon session, which included the following addresses:

"Report of Accident Prevention in Cement Industry for 1929," by A. J. R. Curtis, Portland Cement Association.

"Electrical Hazards in Industry," by R. H. Miller, manager, General Electric Co., Des Moines.

"Results Obtained from Physical Examinations at Duluth Plant," by A. S. Hetherington, Universal Atlas Cement Co., Duluth, Minn.

"Present Status of Industrial Medicine," by Dr. H. E. Ransom, Des Moines, Ia.

H. F. Tyler, first vice-president, Dewey Portland Cement Co., Davenport, Ia., was chairman of the luncheon, at which an address was made by Henry Hoyer, commissioner of labor for Iowa.

The afternoon session was guided by R. H. Bechtold, superintendent, Pennsylvania-Dixie Corp., Des Moines, Ia. The following plant departments and their accident hazards were discussed:

"Quarry and Crushing Department," by G. S. Parker, superintendent, Dewey Portland Cement Co., Davenport, Ia.

"Raw, Burning and Finish Department," by Stanley Griffith, master mechanic, Pennsylvania-Dixie Cement Corp., Des Moines, Ia.

"Power, Shops and Repair Departments," by Robert Patterson, Lehigh Portland Cement Co., Mason City, Ia.

"Packing, Shipping and Storage Department," by S. A. Bemis, foreman, Northwestern States Portland Cement Co.

"Railroad and Yards Department," by H. M. Hanson, assistant superintendent, Northwestern States Portland Cement Co.

"Coal Grinding and Handling Department," by George W. Cross, foreman, Dewey Portland Cement Co., Davenport, Ia.

"Construction Department," Carroll Bennett, assistant superintendent, Hawkeye Portland Cement Co., Des Moines, Ia.

"Practical Value of First Aid Training," by W. D. Ryan, U. S. Bureau of Mines.

Mr. Ryan also conducted the practical contest between teams representing the Hawkeye, Pennsylvania-Dixie, and Dewey plants. The judges of this event were Dr. John M. Griffith, Des Moines, Ia.; E. R. Maize, junior engineer, U. S. Bureau of Mines; and Claude P. Dempsey, foreman miner, U. S. Bureau of Mines. The Hawkeye team led with a score of 99, but was closely followed by the Pennsylvania-Dixie team with a score of 98½, and the Dewey team with a score of 98 1/3. The teams were given special commendations for their exceptional excellence.

Arthur H. Brayton, editor of *Merchants Trade Journal*, Des Moines, was the principal speaker at the evening dinner. Edward O'Dea of Des Moines served as toastmaster.

Kansas City Meeting

The Kansas City regional meeting was held Tuesday, March 25, with headquarters at the Hotel Muehlbach, and was held in conjunction with the

Central States Safety Congress, the cement section holding its sessions at the Kansas City Athletic Club. R. M. Johnston, district superintendent of the Consolidated Cement Corp., Mildred, Kan., was general chairman in charge of the following morning session program:

"Safety in Industry," by Dr. F. V. Meriwether, U. S. Bureau of Mines, Picher, Okla.

"Powdered Coal Hazards," by J. G. Stadler, Lehigh Portland Cement Co., Iola, Kan.

"Responsibilities of Foremen from the Angle of Foremen's Opportunities," by Guy Gardner, Ash Grove Lime and Portland Cement Co., Chanute, Kan.

"Packing and Loading Hazards," by R. A. Loveland, Dewey Portland Cement Co., Dewey, Okla.

"Dangers in the Machine Shop," by J. J. Adams, Consolidated Cement Corp., Mildred, Kan.

"Safety in the Quarry," by C. P. Mitchell, Monarch Cement Co., Humboldt, Kan.

At the afternoon session the following topics were presented:

"Electrical Hazards," by George Burgess, Missouri Portland Cement Co., Sugar Creek, Mo.

"Plant Housekeeping," by L. J. Wheeler, Lone Star Cement Co., Bonner Springs, Kan.

"Yards," by A. K. Frolich, Ash Grove Lime and Portland Cement Co., Louisville, Neb.

"Waste Heat," by C. M. Carman, Universal Atlas Cement Co., Atlas Division, Independence, Kan.

"June No-Accident Month, Its Advisability," by T. F. McClaren, Consolidated Cement Corp., Fredonia, Kan.

"Work of the Portland Cement Association," by E. R. Rogers, district engineer, Portland Cement Association, Kansas City, Mo.

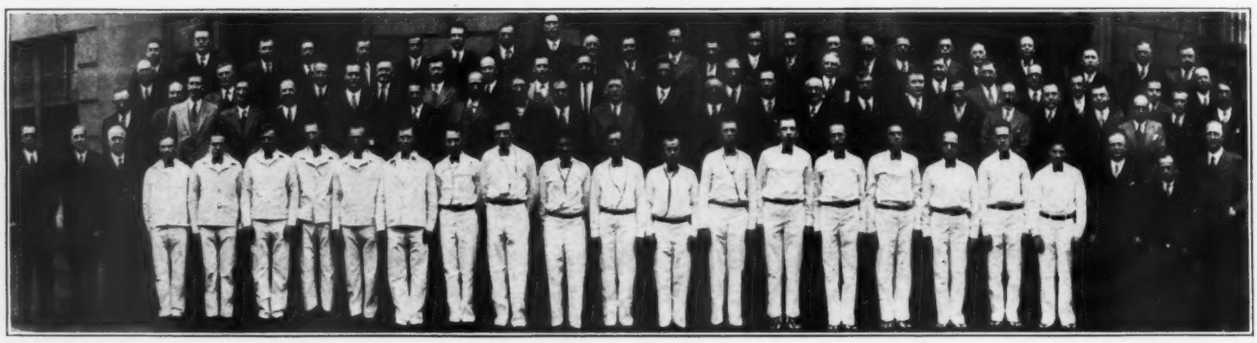
Drilling and Blasting Hazards

Speaking on the dangers attending drilling and blasting operations in his talk on "Safety in the Quarry," Mr. Mitchell brought out the following good advice:

"Drillers, like other employees of quarries, suffer injuries from accidents and close attention to the operation being performed is always essential. Thinking of other things and temporarily letting the mind wander has resulted in accidents more than once. For example, reaching for the wrong lever may result in raising the bit instead of the bail, causing confusion that may cause an accident. Gauging the height to raise the bit is an important part of the work. About four years ago we purchased a new Star Drill for our quarry and the Star Drilling Co. sent one of its expert men to put the drill in operation. He had the bit resting out of the hole and thought he was reaching for the lever that controlled the bail; instead he got hold of the lever that controlled the bit. In the mix-up he let the bit drop, breaking his leg above the knee.

"Jackhammer drill operators work on the face of the rock or in the quarry proper and are subject to various hazards. Danger of injury from the drill itself is somewhat remote, unless caused by bursting of hose or fitting on or near the drill. One serious hazard in this operation is the possibility of the bit breaking in the shank or stem. When this happens the drill is apt to fall on the operator's foot. The operator should always have this in mind, especially when starting holes. The chief hazards of the work are those of sliding or creeping rocks above the men or the movement of rocks which they may be drilling. Loose rock must be pulled down in advance of the operator's work. Drillers should always stand facing the quarry face so if any rocks slide down the face the driller will be more easily and quickly warned than if they stand with their backs or sides to the face of the quarry. Goggles should be worn by drillers to prevent injuries to the eye. The presence of drillers must always be kept in mind by the blasters.

"Too much emphasis cannot be placed on the safe handling of explosives and accessories. Only thoroughtly qualified and experienced persons should be allowed to handle or use them. Magazines, thawhouses and cap-houses should be of approved construction and should be kept perfectly clean. The areas about these places should be kept free from weeds and grass as a fire precaution. Various grades of explosives should be segregated and neatly piled in the magazines. Steel or other metals should never be used in opening boxes of explosives or in cutting or clipping the wrappers of



First-aid teams and delegates who attended the Des Moines regional safety meeting of Portland Cement Association.

T. F. McClaren

R. M. Johnston

E. R. Rogers

such articles. A special wooden wedge should be provided for opening dynamite boxes. The wedge should be wide enough to free the nails and should be provided with a handle twenty inches long. When such a wedge is used no mallet or pounding is necessary. Thawing of explosives in cold weather should be discouraged as far as possible by the use of low freezing dynamite. When unavoidable, however, extreme care should be taken to keep explosives away from direct heat and to heat it slowly at a low temperature."

Traces Safety Movement

How the spirit of safety got its start in the cement industry and reached its present pinnacle, whereby the cement workers lead all other industries in accident-prevention results, was told interestingly in the afternoon by Mr. McClaren. Some of his remarks were as follows:

"In the beginning of organized safety work in the cement industry, the great trouble was to sell the idea first to the management and later to the men or employees. By 'sell' I mean to convince them that it was practical. Everyone agreed it would be a glorious thing if accidents could be prevented entirely or even materially reduced. Meetings would be held and usually some executive officer, or maybe the superintendent, would indulge in a lot of oratory, or a lot of profanity, in telling the men how anxious the company was to have accidents prevented. They almost invariably ended the talk with the remark that accidents were the result of carelessness and it was up to the men to be careful. They did not say so but they strongly intimated that a careful man would step or walk around an open conveyor and would climb a rope instead of stepping on the rotten rounds of a ladder. The men listened and yawned.

"Finally, however, both sides began to get interested. Some of the mills got organized and began to show results. Statistics were published so that comparisons could be made between mills with practically the same equipment and number of employees and questions were asked as to why the difference in the number of accidents. Mills that were spending the most in money and time in Accident Prevention Work, were showing results beyond belief. Not only were they having fewer accidents than the unorganized mills but were claiming they were actually showing a profit in dollars and cents.

"I haven't the time, nor is it necessary for my subject, to go into the gradual expansion of this work and the awakening of both management and employees to the fact that it was not a theory but a fact and that results were being obtained astounding in their scope."

The annual safety dinner was held in the evening in connection with the Safety Congress banquet and proved to be a highly enjoyable, as well as instructive, affair.

Development of Glass Sands Along Pacific Coast

Although a number of fairly pure deposits of glass sand exist on the Pacific Coast, these are at present being used only for the making of brown or amber glass, the United States Bureau of Mines, Department of Commerce, points out. For white glass, sand is still being imported, mostly from Belgium. An iron content of two or three-tenths per cent prevents the direct use of the domestic sand for white glass, but a number of commercial organizations are attempting to work out methods of beneficiation of local materials.

Pneumatic Conveying System Installed for Handling Bulk Lime*

By H. J. LEVINE
National Brick Corp., Long Island City, N. Y.

IN THE manufacture of any commodity where quantity production is essential to its profitable marketing, and especially where that commodity is both heavy and low in unit cost, the problem of handling, conveying and distributing the various ingredients making up that product is one of prime importance.

Lime, due to its own peculiar properties, does not lend itself so readily to handling as do some of the other nonmetallic mineral products. In this article, the author points out how his company overcame these obstacles by adopting the pneumatic conveying system and sums up the advantages of the method.

In our particular industry the materials we are called upon to handle are sand and lime. Depending upon local conditions existing at individual plants, the conveying and distribution of sand is generally easily and efficiently accomplished by the use of a combination of bucket elevators and belt conveyors. Lime, however, due to special properties inherent in that material and due to the fact that it must necessarily be delivered to the plant protected from the weather, does not lend itself so satisfactorily to the same methods of unloading and conveying, as does sand. In most plants, the bulk lime is delivered in box cars; men are sent in with shovels or a power shovel and unload the lime into a special receiver, whence it is conveyed by bucket elevator to the hydrator bins or storage silos. This method has many obvious disadvantages, which will be discussed later. Our company, forewarned, investigated and studied all forms of handling lime and finally decided on a method of handling bulk lime by pneumatic conveyors.

It is not my intention to give you any of the technical details of the working of the pneumatic conveyor, but rather to give you a simple description of the actual operation of this system as we have installed it in our plant, together with the advantages we believe it possesses over the purely mechanical method of handling lime, and some practical information which might be of service to those of you that might consider installing such a system in your own plant.

We use the so-called hydration system. Our hydrator room is located at the side of our factory nearest our dock and about 75 ft. back from the bulkhead line. The hydrators are located on the second-floor level, about 30 ft. above the level of the dock. After hydration, the hydrate is carried by screw conveyors and deposited in six storage bins directly below the hydrator room floor. Outside on the dock and in line with our hydrators we have a steel storage bin for raw lime having a capacity of about 190 tons. Our lime is delivered at our dock on a railroad float having four cars, two abreast of each other.

Our pneumatic conveying system unloads our cars of lime, conveys the lime to a receiving hopper located directly above the hydrator hoppers, from which it is dropped through a discharging lock into either one of the two hydrator hoppers, and when these hoppers are both full (due to the fact that the pneumatic conveyor has an actual capacity of about ten tons per hour, and our hydrators have only a combined capacity of about six tons per hour) the lime is dropped by gravity into our steel storage bin, which is equipped with an intake hopper at the bottom of the bin with a cut-off valve, from which the raw lime can be reclaimed, by the same system, into the hydrator bins, after all the cars have been unloaded.

The component parts of the pneumatic conveying system are a combined receiving hopper and bag filters weighing about five tons, which are located on an independent steel support located about 10 ft. above the hydrator bins. The bottom of the receiving hopper is equipped with a four-compartment discharging lock, which is kept revolving by a 2-hp. motor, in such manner that the material is being continuously discharged, while at the same time the bottom of the hopper is hermetically sealed so that the vacuum in the system is always maintained. The function of the filter bags is to collect all the fine particles of lime that might otherwise be lost, and a shaker device, operated by compressed air of about 45-lb. pressure, automatically, and at regular short intervals, shakes the filters free of these fine particles and permits them also to be discharged along with the bulkier pieces of lime. A vacuum pump operated by a belt drive from a 50-hp. motor is located on the floor of the factory, which by means of an 8-in. pipe connected with the top of the receiving hopper and filter draws out all

* Read Feb. 5, 1930, at annual meeting, Sand-Lime Brick Association, New York, N. Y.

the air from the hopper and discharges the air free from any trace of lime into the outside atmosphere. From the intake end of the receiving hopper a pipe line, varying from 4 in. and decreasing to 3½ in. in diameter, is run down alongside the building and then out to within a few feet of the edge of the dock, where a cut-off valve is installed. When we are unloading from the cars, flexible rubber hoses with a nozzle at the ends are attached to this valve, which reach into the cars.

The operation of this system is extremely simple. One man pulls the flexible hose into the car which is to be unloaded and plunges the nozzle deep into the lime. The motor operating the vacuum pump and the small motor geared to the revolving discharge lock are simultaneously started. The vacuum pump draws air at a high velocity through the hose and conveying pipe with force sufficient to carry the lime with it. When the air and lime reach the receiving hopper, its velocity is suddenly diminished, due to the much greater cross-section of the hopper over the cross-section of the conveyor pipe, and the material is trapped in the receiver, where it is discharged through the unloading lock. The finer particles of lime are trapped by the bags in the filters, and the air, after being relieved of the material, is drawn through the pump and discharged into the atmosphere. Similarly, when lime is to be reclaimed from the steel storage bin, the cut-off valve on the bottom of the bin is opened, the pump is operated and the material is drawn into the receiving hoppers as before.

Advantages of the System

The advantages we have found from our experience with this system are: (1) Freedom from raising dust and liberation of lime fumes which burn the hands, face and eyes of the worker unloading lime by hand or by power shovel. (2) Flexibility of the location of incoming cars of lime within reasonable limits, as more sections of hose may be added to reach cars further distant from our intake pipe line. (3) Independent of weather conditions, as the lime may be unloaded in all kinds of weather. (4) No loss of material. (5) Cleanliness of operation; no dust or fumes released anywhere in the plant from this operation. (6) Simplicity of all working parts of this system, conducive to low upkeep and few repairs. (7) Small reduction in the cost of handling the material. (8) No yard space is required for any equipment or conveying apparatus.

In considering the installation of a pneumatic system for conveying lime, many factors should be carefully weighed. The advantages cited above should be balanced against the initial cost of the system, the number of tons of lime used per year, and the storage capacity of the plant. Alterations of the factory may be involved, as the receiving bin and filters must be located about ten feet above hydrator bins or silos, and the receiver itself measures about eighteen feet in height. This receiver and filter (weighing about five tons) is subject to considerable vibration caused by the shaking device of the filter bags and should be independently and substantially supported. The piping should have tongue and grooved flanges to maintain a uniform cross-section of pipe, allowing free and unobstructed passage of the material; should be made up of straight sections as far as conditions will permit and have as few bends or curves as possible; wherever bends are required they should have at least a 6-ft. radius and be not more than a 45-deg. curve, if possible. Improper piping will seriously curtail the capacity of the system. The vacuum pump should be of sturdy construction, but of the simplest rotor type.

There are many makes of pneumatic conveying systems, but great care should be exercised in the selection of the one best adapted to do the work required. In this connection, it should be clearly remembered that what we are after is a system as simple as possible to unload our material at its place of arrival and to deliver it to the place where it is to be stored or hydrated. In our opinion, this is best accomplished by a system drawing or "sucking" it up directly to its place of delivery rather than by any "blowing" or more complicated system of "sucking" it to an intermediate point and then "blowing" it to its final destination.

We have also experimented with the pneumatic conveying of the hydrated lime, which has proved to be a more complicated problem to solve. We feel, however, that we are well on our way to overcome the obstacles we encountered, and hope that at our next meeting we will be able to give you the results of our efforts in this direction.

United States Gypsum Buys Metal-Lath Concern

Acquisition of the metal-lath division of the Youngstown Pressed Steel Co., Warren, O., has been announced by the United States Gypsum Co. Something more than a year ago the gypsum company entered the metal-lath field, and growth of the business has made necessary increased production and distribution facilities. Only the metal-lath division was acquired. Other divisions of the company will be operated by the Youngstown Pressed Steel Co. as heretofore.

Metal-lath products manufactured by the Milwaukee Corrugating Co. and marketed by the United States Gypsum Co., will be actively continued.

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

JOHN C. BEST

President,
Best Bros. Keene's Cement Co.
Medicine Lodge, Kansas.

Personal Mention

R. H. McGredy has become connected with the Harnischfeger Sales Corp. of Milwaukee, Wis. He will be employed in an executive sales capacity with headquarters at 50 Church St., New York City.

H. D. Palmore has been appointed highway engineer of the state of Kentucky, succeeding **J. S. Watkins**, resigned. Other resignations in the department include **W. M. Jarvis**, engineer of maintenance, and **D. Niles Evans**, engineer of equipment.

W. R. Angell, president of Continental Motors Corp., announces the appointment of **Louis J. Kanitz** as general sales manager of the organi-

L. J. Kanitz

zation. Mr. Kanitz joined the Continental Motors Corp. in February, 1920, after resigning his commission as Lieut. Commander in the United States Navy. For the past three years he has been in charge of the industrial engine division of the company. Mr. Kanitz was instrumental in the formation of that branch of Continental's activities.

Ford J. Twaits has been appointed general manager *pro tem* of Consolidated Rock Products Co., Los Angeles, and is scheduled to be elected president at the next directors' meeting. Mr. Twaits is executive vice-president

Ford J. Twaits

of the Consolidated Steel Corp., Los Angeles, a position he will continue to hold, and was previously a partner in the building firm of Scofield-Twaits Company. His appointment followed the resignation of **George A. Rogers**, former head of Union Rock Co., until its merger into Consolidated Rock and for the past six months acting general manager of the latter organization, who will devote his attention to his own varied business interests. It was understood at the time Mr. Rogers came back to Consolidated after a tour of Europe that his acceptance of the managership was temporary pending completion of operating details of the company. Favorable action on Mr. Twait's election to the presidency is a certainty, for his reputation as one of the keenest executive minds and his personal friendship with all contracting firms, builders and architects in southern California make him the man most eminently fitted to direct the destinies of the company, according to the announcement.

John Keplinger, formerly advertising manager, has been appointed sales director for the Hercules Motors Corp., Canton, O. He is succeeded in his former position by **N. F. Summerville**, who has had similar duties with the Zenith-Detroit Corp., Buda Company, and Chevrolet Motor Car Co.

Obituary

David P. Thompson, assistant to the president and director of the Inland Steel Company, Chicago, Ill., died at Miami Beach, Fla., Monday, March 24, 1930, from pneumonia. Funeral services were held March 27 in Newcastle, Pa., where he was born August 3, 1880. He was the son of Alexis W. Thompson, at one time president of the Republic Iron and Steel Co. and later president of the Inland Steel Co.

After graduation from Andover Academy and Yale University, he entered the employ of the Republic Iron

David P. Thompson

and Steel Co., later becoming president of the Sharpesville Furnace Co., Sharon, Pa. He entered the employ of the Inland Steel Co. in 1912.

He was also president of the Inland Lime and Stone Co., with operations at the head of Lake Michigan near Manistique, Mich.

John Burnett, 78, for many years active in the production of granite in New Hampshire, died recently at his home at Milford, N. H. He was long associated with his brother, Henry, in the operation of a granite quarry as Burnett Bros. Mr. Burnett was a native of Banff, Scotland, and came to America in 1873. Besides the widow, he is survived by two daughters.

Road Builders Meet at Washington on May 15

The regular annual meeting of the American Road Builders' Association will be held May 15, 1930, at 3 o'clock, in the association offices, 914 National Press Bldg., Washington, D. C. The officers and directors elected at the recent convention in Atlantic City will be installed; the reports of the president, the treasurer, the engineer-director and the board of directors of the association, and of the presidents of the various divisions will be received; and such other business transacted as may seem necessary.

The annual president's dinner will be held at 7 p. m. in the Willard Hotel.

The regular annual meeting of the City Officials' Division will be held Friday, May 16, at 11 a. m., at the offices of the Association. At this meeting will be installed the officers and directors of the division elected at the recent meeting in Atlantic City; and the reports of the board of directors and of the officers whose terms expire at this meeting will also be received and any other necessary business transacted.

The regular annual meeting of the County Highway Officials' Division will be held at the same hour and place and the officers and directors of this division elected at the recent meeting in Atlantic City will be installed; and the reports of the board of directors and of the officers whose terms expire at this meeting will be received and such other business as may be deemed necessary will be transacted.

Chicago Pneumatic Tool Opens Three New Offices

The Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y., announces the opening of three new branch offices as follows: Oklahoma City, Okla., Perrine Bldg.; Tulsa, Okla., 327 Philcade Bldg.; and Houston, Texas, Merchants & Manufacturers Bldg.

Service stations and warehouses have been established at both Oklahoma City and Houston.

Statement of Ownership

PIT AND QUARRY

Statement of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of PIT AND QUARRY, published bi-weekly at 538 S. Clark Street, Chicago, Ill., for April 1, 1930. State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared V. E. Larsen, who, having been duly sworn according to law, deposes and says that he is the business manager of PIT AND QUARRY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse side of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Complete Service Publishing Co.; Editor, S. A. Phillips; Managing Editor, A. J. Hoskin; Business Manager, V. E. Larsen.

2. That the owners of 1% or more of the total amount of stock are: H. W. Baumgartner, I. A. Baumgartner and V. E. Larsen, all of Chicago, Ill.

3. That there are no bondholders, mortgagees, or other security holders owning or holding 1% or more of total amount of bonds, mortgages or other securities.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest, direct or indirect, in the said stock, bonds, or other securities than as so stated by him.

V. E. LARSEN,
Business Manager.

Sworn to and subscribed before me this 24th day of March, 1930.

(Seal.)

M. J. STANTON.
Notary Public.

(My commission expires December 8, 1930.)

New Corporations

Magnolia Lime Products Co., Brandon, Miss. $5,000.

Long Stone Co., Eureka Ave., Lima, Ohio. Val Heil. $20,000. (previously reported at Columbus, Ohio.)

Rensselaer Sand & Gravel Co., Rensselaer, N. Y. $50,000.

Camden Gravel Co., Camden, Ark. Geo. K. Force, Pres., Reader, Ark.; Andy R. Taylor, Vice-Pres.-Sec., St. Louis, Mo. $20,000. (Previously reported at Reading, Ark.)

New Martinsville Sand & Gravel Co., New Martinsville, W. Va. C. C. Robertson, James H. Boyd, Rex L. Burrill, Geo. B. Mullin, M. E. Braun, all of Pittsburgh, Pa. $10,000.

Concrete Pipe & Sand Co., Wheeling, W. Va. To produce sand and gravel and manufacture cement products. Albert W. Laas, J. H. Bruning, Carl O. Schmidt. $50,000.

Blue Bell Lime Co., Flourtown, Pa. Limestone, lime, and products. $10,000.

Morris County Sand & Gravel Co., Netcong, N. J. Temporary office, 435 Central Ave., E. Orange, N. J. John J. Voorhees, Treas. $250,000 pfd.; 25,000 shares com.

St. Albans Sand Co., St. Albans, W. Va. L. P. Harvey, % Schoolfield-Harvey Electric Co., Charleston, W. Va. Office and plant at St. Albans. $10,000.

Bushnell Basin Sand & Gravel Corp., 60 Scio St., Rochester, N. Y. Major stockholders, Quippa & Battle. $50,000.

Brooklyn Sand & Gravel Corp., % Foley & Martin, 64 Wall St., New York City. 100 shares com.

Pilgrim Sand & Gravel Corp., % W. B. Carman, Farmingdale, N. Y. $20,000.

Miller Sand & Gravel Co., Elizabethton, Tenn. F. A. Swift, W. B. Kester, M. F. Miller. $20,000.

T. E. Stephenson Sand & Gravel Co., Monticello, Miss. (Previously reported at Jackson, Miss.) T. E. Stephenson, Pres., L. H. Stephenson, Sec. $30,000.

Marl Products, Inc., Route 2, Dousman, Wis. Joseph J. Justen, H. J. Sanville, both Milwaukee; Carl Fiebke, Delafield, Wis. $50,000.

Eastburn Sandstone Corp., Curwensville, Pa. Charles T. Eastburn. To quarry sandstone. $5,000.

Manufacturers' Publications

Each publication listed below contains information of interest to non-metallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Buckets

Hayward's Digging Clam-Shell. 8 p., 15 ill. (Bulletin 654, The Hayward Co., New York, N. Y.) Describes and illustrates the improved Class K clam-shell bucket equipped with manganese steel teeth.

Page Buckets. (Bulletin 400A, 16 p., 23 ill.; Bulletin 500A, 16 p., 23 ill. Page Engineering Co., Chicago, Ill.) Describes and illustrates buckets of from ⅜ to 10 cu. yd. capacity and shows the various types in use on the job.

Building

Standardized Service in Steel for One-Story Building. 12 p., 35 ill. (The Macomber Steel Co., Canton, O.) Describes and illustrates methods of utilizing structural and fabricated steel for small building construction.

Cement

Advance Reground Portland Cement. 8 p. (Advance Waterproof Cement Co., Chicago, Ill.) Describes and gives specification of a portland cement of unusual fineness and gives recommendation for designing various concrete mixtures.

Concrete Machinery

Besser Tampings. 4 p., 8 ill. (Besser Manufacturing Co., Alpena, Mich.) Describes and illustrates machinery for the manufacture of concrete building units.

Cranes

"The American Gopher at the Crescent Gravel Co. Plant." 1 p., 3 ill. (*The American Bulletin*, Feb., 1930. American Hoist and Derrick Co., St. Paul, Minn.) Describes and illustrates the use of cranes at a sand and gravel plant, giving performance data.

Drills

"What's Your Drilling Costing You?" 2 p., 1 ill. (*The Armstrong Driller*, March, 1930. Armstrong Manufacturing Co., Waterloo, Ia.) Analyzes the cost per day and per hole of blast-hole drilling in quarries and suggests economies.

Dust Recovery

Is Smoke Responsible for Property Damage? 4 p., 10 ill. (Bulletin 1-B. The Dust Recovery and Conveying Co., Cleveland, O.) An article by the commissioner of trade waste of Cleveland, O., pointing out the desirability of recovering carbon from industrial smoke and gases.

Explosives

Building New York's Newest Subway. 8 p. (E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.) Describes blasting methods used in the construction of the subway and offers a motion picture film for free use of those interested.

Lubrication

Alemite Industrial Lubrication. 8 p., 13 ill. (Alemite Corp., Chicago, Ill.) Describes and illustrates the adaptability of high-pressure lubrication to various types of industrial machines.

"Lubrication of Gears." 5 p., 2 ill. (*Black and White*, April, 1930. E. F. Houghton & Co., Philadelphia, Pa.) Traces the lubricating action in gears, especially in speed reducers, and gives valuable pointers as to the proper use and selection of lubricants for these purposes.

Machinery Used

For Sale or Rent. 2 p., 1 ill. (The Acme Equipment Co., Inc., Detroit, Mich.) Lists used shovels, cranes, draglines and other plant and quarry equipment for sale or rent by this concern.

Zelnicker's Bulletins. 12 p., 4 ill. (Bulletins 404 and 405. Walter A. Zelnicker Supply Co., St. Louis, Mo.) Lists used machinery for every description in the pit-and-quarry industrial field.

Mills, Pulverizing

Fuller-Lehigh Pulverizing Mills. 4 p., 5 ill. (Bulletin 902. Fuller-Lehigh Co., Fullerton, Pa.) Describes and illustrates mills for pulverizing coal and other materials, both of the air and screen-separation types.

Type A Crushers, Grinders and Pulverizers. 6 p., 12 ill. (Stedman's Foundry and Machine Works, Aurora, Ind.) Describes and illustrates the application and use of reduction machinery and lists specifications.

Pumps, Centrifugal

Pumps. 12 p., 4 ill. (Ocala Iron Works, Ocala, Fla.) Describes and illustrates the use of centrifugal pumps in the sand-and-gravel and pebble phosphate fields.

Screens, Vibrating

"The Good Roads Vibrating Screen." 2 p., 1 ill. (*Good Roads*, Vol. 3, No. 1. Good Roads Machinery Co., Kennett Square, Pa.) Points out the salient features of this vibrating screen and describes the screening action.

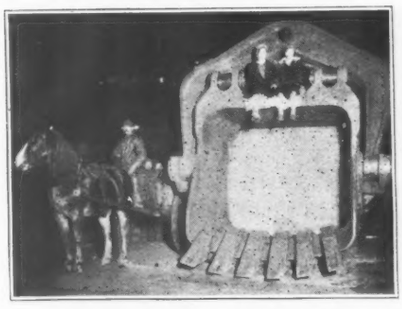
Steel, Manganese

The Amsco Bulletin. 8 p., 18 ill. (The American Manganese Steel Co., Chicago, Ill.) Describes and illustrates the use of manganese steel dredge buckets, pulley sheaves and chain in various plant operations.

Largest All-Manganese Steel Dipper Ever Made Weighs 37 Tons

An all-manganese steel power shovel dipper, by far the most massive of its kind ever built was recently cast and assembled at the Chicago Heights plant of the American Manganese Steel Co. for the United Electric Coal Co., Danville, Ill. It is in use at the Duquoin strip mine under the direction of J. W. Fellmeth, operating engineer, to whom we are indebted for the interesting facts presented here.

The dipper is 14 ft. high over the bail, 12 ft. wide between outsides of bail brackets and 14 ft. from the ends of the dipper teeth to the bottom of the door. It weighs 37 tons empty and is of 15 cu. yd. capacity.



15 cu. yd. manganese steel dipper

A busy statistician has figured out its weight as being about 370 times that of the two girls perched on the upper edge of the bucket back or

Huge shovel on which dipper is used

about 740 times the weight of one of the two girls, and almost twice the weight of any one load of material it will handle.

This dipper is used at one of the largest strip mines in Illinois, and is in service on one of the world's largest electric power shovels (built by the Marion Steam Shovel Company) for stripping overburden from coal. Some idea as to the size of the shovel on which it will be used is found in the fact that a full size seven passenger automobile can be driven under it when operating on level ground.

The specifications of the shovel follow:

Length of boom	120 ft.
Length of handle	83 ft.
Size of dipper	15 cu. yd.
Working weight	3,300,000 lb.
Overall height	73 ft.
Height of dump	82 ft.
Radius of dump	144 ft.
Height of boom	115 ft.
Hoist cable	2⅛ in.

The entire plant is electrified with General Electric Co. equipment so far as it is economically possible. This includes all of the stripper shovels, as well as the loading shovels and tipple.

New Equipment Chosen for Georgia Lime Plant

A brief item in our issue of March 26 concerning a new crushing plant of the Southern Lime Products Co., at Cordele, Ga., should have included mention of four standard friction-drum hoists and two 5-cu. yd. automatic end-dump cars as pieces of new equipment that have been furnished by the Ocala Iron Works, Ocala, Fla.

Recent Patents

PIT AND QUARRY *will furnish, at its actual cost, a copy of any patent cited below. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.*

AMERICAN

Concrete Manufacture

Manufacture of bituminous concrete. Leonard S. van Westrum, London, England, assignor to Bitucrete Limited, same place. No. 1,752,214.

Process of preparing an oxychloride cement (concrete). Joseph U. Ahlmann Ohlsen, Copenhagen, Denmark. No. 1,752,194.

Cranes

Boom-angle indicator for cranes. Erich H. Lichtenberg, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,750,962.

Locomotive crane. Alpheus E. Holcomb, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,751,633.

Excavating

Drag bucket. Lewis E. Younie, Portland, Ore., assignor to Electric Steel Foundry Co., same place. No. 1,751,967.

Excavating dipper. Walter E. Miley, Marion, O., assignor to Marion Steam Shovel Co., same place. No. 1,751,745.

Measuring

Automatic measuring tank. George E. Webb, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,750,978.

Water measuring tank. George E. Webb, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,750,979.

Miscellaneous

Method and apparatus for projecting loose material. Bjarne H. Schieldrop, Pittsburgh, Pa., assignor to Blaw-Knox Co., same place. No. 1,750,864.

Plaster Products

Plaster wall-board and method of making same. Harry E. Brookby, Evanston, Ill., assignor to United States Gypsum Co., Chicago, Ill. No. 1,750,621.

Pulverizing

Pulverizing machine. Walter J. Armstrong, Columbus, O., assignor to Jeffrey Mfg. Co., same place. No. 1,751,611.

Pulverizer mill. Russell O. Groman, Catasauqua, Pa., assignor to Fuller-Lehigh Co., Fullerton, Pa. No. 1,750,636.

Grinding mill. Ralph M. Hardgrove, Bethlehem, Pa., assignor to Fuller-Lehigh Co., same place. No. 1,751,918.

Pulverizing machine. William K. Liggett, Columbus, O., assignor to Jeffrey Mfg. Co., same place. No. 1,751,009.

Road-building

Power-Swing mechanism for paver booms. John Daniel, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,751,266.

Subgrade planer and concrete-distributing machine. Erich H. Lichtenberg, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,750,896.

FOREIGN

Cement manufacture

Process for manufacturing waterproof composition for Portland cement. H. Hamakado. British 325,991.

Process for calcining of lime, cement, magnesite and the like. Harry Stehmann. German 494,197.

Process for manufacture of Portland cement and sulphuric acid from substances containing calcium sulphate. H. Meuris. French 682,121.

Crushing and grinding

Adjustable cage for crushers. William P. Gruendler. Canadian 298,348.

Means for disintegrating solid materials. H. A. Pertwee. British 325,583.

Improvements in pulverizers. P. A. Hirsch. French 682,194.

Pulverizing equipment. G. Flax. French 682,318.

Crusher. C. Plucker. French 682,451.

Machine for crushing various materials. Societe Talleres Trill. Soc. Anon. French 681,614.

Pulverizer. Kramer & Co. French 681,659.

Drills

Cradle for rock drills. Baron Marks (Ingersoll-Rand Co.). British 325,636.

Percussive hand tools. A. E. Horwell. British 325,479.

Protective device for rock drills. Ingersoll-Rand Co. British 310,947.

Retractive device for rock drills. Ingersoll-Rand Co., British 307,048.

Drying and cooling

Apparatus for drying and cooling of stone, slag and like material. S. L. Thorne and Tilbury Contracting & Dredging Co. British 325,489.

Rotary dryer. Buettner-Werke Akt.-Ges. German 494,188.

Rotary dryer. Max Weiss. German 494,307.

Continuous drying system. P. Barducci. French 681,667.

Material-Handling

Car dumper. Georg Muenning. German 494,564.

Conveyors. H. E. Hill. British 325,929.

Elevator. Kohlenveredlung Akt.-Ges. German 494,562.

Endless conveyors and like apparatus. W. A. Spriggs. British 325,571.

Method of emptying containers filled with pulverulent material. A Droll and Vereinigte Westdeutsche Waggonfabriken Akt.-Ges. British 325,544.

Movable cranes. Ransomes & Rapier, Ltd. French 682,368.

Shaking conveyors. T. G. Nyborg and M. F. Higgins. French 682,029.

Miscellaneous

Device for operating shaft furnaces. Otto Hubmann. Canadian 298,541.

Wallboard joint system. United States Gypsum Co. Canadian 298,704.

Cement guns. H. Pardoe and A. B. Britton. British 326,002.

Rotary screens or separators. W. Reid, R. H. Reid and W. Reid, Jr. British 326,081.

Valve-bag-filling machine. Modern Valve Bag Co. German 494,290.

Portable concrete mixer. H. P. Paris. French 681,853.

Coming Events

April 15, 1930. Albany, N. Y. Portland Cement Association regional safety meeting, at Hotel Ten Eyck. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

Apr. 20-27, 1930. Mexico City, Mex. National Highway Commission of Mexico third highway congress. Chas. M. Upham, engineer-director, American Road Builders' Association, can furnish particulars.

April 25, 1930. Chicago, Ill. Midwest regional meeting, Employees' Publication section, National Safety Council. Chas. A. Ward, general chairman, 20 N. Wacker Drive, Chicago.

April 26, 1930. New York, N. Y. Eastern regional meeting, Employees' publication section, National Safety Council. Stanley W. Wood, chairman, 65 Broadway, New York, N. Y.

May 12, 1930. Cleveland, O. Meeting, Steel Founders' Society of America. G. P. Rogers, managing director, 932 Graybar Bldg., New York, N. Y.

May 15, 1930. Washington, D. C. Annual meeting, American Road Builders' Assn., at 914 National Press Bldg. Chas. M. Upham, engineer-director, same address.

May 19-20, 1930. White Sulphur Springs, W. Va. Annual meeting, American Refractories Institute. Dorothy Texter, secretary, Oliver Bldg., Pittsburgh, Pa.

May 29, 1930. Easton, Pa. Portland Cement Association regional safety meeting, at Hotel Easton. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

June 3-4, 1930. Chicago, Ill. National Lime Association annual convention at Edgewater Beach Hotel. W. V. Brumbaugh, assistant secretary, 927 Fifteenth St., Washington, D. C.

June 16-25, 1930. Berlin, Germany. World Power Conference. World Power Conference Program Committee, Room 818, 29 W. 39th St., New York, N. Y.

June 24, 1930. Cleveland, O. Portland Cement Association regional safety meeting, at Hotel Cleveland. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

June 26, 1930. Washington, D. C. Portland Cement Association regional safety meeting, at Hotel Raleigh. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

July 1, 1930. Detroit, Mich. Portland Cement Association regional safety meeting, at Book-Cadillac Hotel. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

Sept. 9, 1930. Seattle, Wash. Portland Cement Association regional safety meeting, at New Washington Hotel. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

Sept. 16, 1930. San Francisco, Cal. Portland Cement Association regional safety meeting, at St. Francis Hotel. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

Hercules Powder Elects R. H. Dunham President

Officers for the ensuing year were elected at a meeting of the directors of the Hercules Powder Co., at Wilmington, Del., March 26. The officers elected were as follows: R. H. Dunham, president; J. T. Skelly, vice-president; T. W. Bacchus, vice-president; N. P. Rood, vice-president; C. D. Prickett, vice-president; G. G. Rheuby, vice-president; C. A. Higgins, vice-president; C. C. Hoopes, treasurer; E. B. Morrow, secretary.

The directors voted the regular quarterly dividend of $1.75 on the company's preferred stock, payable May 15 to stockholders of record, May 3.

Three Air Filter Firms Form Holding Company

On April 1 the separate manufacturers that had previously operated as the Reed, Midwest, and National Air Filter companies were consolidated into the American Air Filter Co., Inc., which had been a holding company for the three concerns.

Engineering Firm Moves Chicago Office Location

Jean M. Allen & Co., contracting and consulting engineers, formerly at 332 South Michigan Ave., have moved their offices to 75 East Wacker Drive —the Mather Tower—Chicago, Ill. This firm specializes in dredging, dredging machinery, contractors' and marine equipment, and sand-gravel plants.

Stanton Walker, of Washington, D. C., chief of the engineering and research department of the National Sand and Gravel Association, addressed members of the Indiana Sand and Gravel Association in the Claypool hotel on March 14. President W. H. Sanders, of Lafayette, presided.

Eugene Enloe, of Spokane, Wash., formerly a director of the Idaho Portland Cement Co., Inkom, Idaho, has been elected president to succeed **E. J. Simons**, resigned. **J. B. Maxfield** has been named general manager. The company plans to install additional equipment at its plant shortly and has completed plans for the construction of a plant to manufacture cement products.

B. M. Clark has been appointed manager of sales of the Heltzel Steel Form and Iron Co., Warren, O., succeeding **W. J. Savage**, who recently resigned. Mr. Clark has held the position of assistant manager of sales for several years.

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

Pacific Coast Aggregate Firm Has Good Report

Pacific Coast Aggregates, Inc., which commenced operations last September as a consolidation of the principal rock and gravel companies of Central California, reports net income for 1929, after all charges, except depreciation, depletion and amortization of bond discount, of $318,702.70, which is three and seven-tenths times interest on first mortgage bonds. After this deduction there remained a balance equal to six and six-tenths times interest requirements on its debentures.

Balance sheet as of December 31, 1929, shows current assets of $1,829,-163.04, from which $31,123.67 was deducted as a credit to the depletion fund, leaving total current assets of $1,798,039.37, of which $731,263.43 is in cash or on deposit, or has been loaned on liquid securities. Current liabilities amount to only $586,925.59, leaving net current assets of $1,271,-113.78.

At the opening of the year six producing plants were operating continuously and seven intermittently, while fifteen distributing plants were operating all or part of the time. Three distributing plants have been leased to other dealers on short-term leases. Production up to January 1, 1930, was approximately 1,141,000 tons of rock, sand and gravel, approximately 70 per cent of this being rock and gravel.

Total sales of building material to January 1 were $786,900; the total sales of fuel, $105,400. Orders for rock, sand and gravel booked, but not shipped to January 1 was 777,000 tons.

Pacific Portland Cement in Stronger Position

At the annual meeting of the stockholders of Pacific Portland Cement Co., President R. B. Henderson stated in his report that net profits for the year 1929 were equal, after preferred dividends, to $5 per share on the 82,500 shares of common stock outstanding. No further details of earnings were available as the company does not make its income statement or balance sheet public.

The report of the president showed further that the volume of cement and plaster business during the year was disappointing and that there was a nation-wide reduction of 3.7 per cent in consumption as compared to 1928. With the price index of 1926 taken as 100, the price index was 89 for 1929 as compared with 96.5 in 1928.

The company's cash position was reported as stronger than it has been for a number of years and its ratio of current assets to current liabilities is stated to be practically 9 to 1.

International Cement Nets $7.88 Per Share

International Cement Corporation has issued its pamphlet report for the year ended December 31, 1929, showing net income of $4,950,433 after federal taxes, depreciation, depletion and other charges, equivalent to $7.88 a share on 627,865 no par shares of capital stock. This compares with $5,149,388 or $7.90 a share on 618,826 common shares in 1928, after dividend requirements on the 7% preferred stock retired in May.

Consolidated income account for the year 1929, compares as follows:

	1929	1928
Sales	$28,370,031	$27,595,096
Exp. depr. and dpl.	22,169,943	21,454,617
Profit	$6,200,088	$6,140,479
Other inc.	420,838	436,014
Total inc.	$6,620,926	$6,576,493
Int. fed. tax, etc.	1,670,493	1,427,105
Net income	$4,950,433	$5,149,388
Pfd. divs.		256,376
Com. divs.	2,484,649	2,418,978
Sub. divs.	1,708	2,967
Surplus	$2,464,076	$2,471,067
P. and L. surp.	13,670,836	11,982,485

Surplus account follows: Surplus December 31, 1928, $11,982,485; add: surplus for year 1929 after dividends, $2,464,076; total surplus, $14,446,561; deduct: surplus of subsidiary company in Argentina set aside in accordance with laws, $23,531; increase in reserve for exchange on net current assets in South America and other net adjustments, $69,109; equipment dismantled, etc., $683,085, leaving surplus as of December 31, 1929, $13,-670,836.

Indiana Limestone Has Record First Quarter

The first quarter of the present fiscal year will be the best in the history of the company according to Frank S. Whiting, treasurer of Indiana Limestone Co., following a recent meeting of the board of directors.

CURRENT DIVIDENDS

COMPANY	CLASS OF STOCK	DIVIDEND RATE	HOLDERS OF RECORD	PAYABLE
American Aggregates Corp.	Preferred	1¾% qr.	Mar. 20	Apr. 1
Assoc. Portland Cement Mfrs., Ltd.	Am. Dep.	8%	Mar. 17	Apr. 1
Boston Sand and Gravel	Preferred	$.87 qr.	Mar. 22	Apr. 1
Boston Sand and Gravel	Common	$.40 qr.	Mar. 22	Apr. 1
Calaveras Cement Co.	7% Pfd.	1¾% qr.	Mar. 30	Apr. 15
Canada Cement	6½% Pfd.	1⅝% qr.	Feb. 28	Mar. 31
Canada Gypsum and Alabastine	New stock	$.37½ qr.	Mar. 14	Apr. 1
Cleveland Builders Supply	Common	$.50 qr.	Mar. 15	Apr. 1
Consolidated Oka Sand and Gravel	Preferred	1¾% qr.	Mar. 27	Apr. 1
Consumers Co.	Pr. Pfd.	$1.50 qr.	Mar. 15	Apr. 1
Coronet Phosphate Co.		$2.00 qr.	Mar. 14	Apr. 1
Dolese and Sheperd		$2.00 qr.	Mar. 20	Apr. 1
Duffern Pav. and Crushed Stone	7% Pfd.	1¾% qr.	Mar. 17	Apr. 1
Ideal Cement Co.	Common	$1.75 qr.	Mar. 13	Apr. 1
Illinois Brick		$.60 qr.	Apr. 1	Apr. 15
International Cement	Common	$1.00 qr.	Mar. 11	Mar. 28
International Salt		1½% qr.	Mar. 16	Apr. 1
Johns Manville	Preferred	$1.75 qr.	Mar. 11	Apr. 1
Johns Manville	Common	$.75 qr.	Mar. 25	Apr. 15
Kentucky Rock Asphalt	Common	$.40 qr.	Mar. 15	Apr. 1
Laclede Clay Products	Preferred	1¾% qr.	Mar. 29	Apr. 1
Lawrence Portland Cement		1% qr.	Mar. 14	Mar. 30
Lehigh Portland Cement	Preferred	1¾% qr.	Mar. 14	Apr. 1
Limestone Products	7% Pfd.	1¾% qr.	Mar. 15	Apr. 1
Medusa Portland Cement	Preferred	1½% qr.	Mar. 25	Apr. 1
Medusa Portland Cement	Common	$1.50 qr.	Mar. 25	Apr. 1
Metropolitan Paving Brick	Preferred	$1.75 qr.	Mar. 15	Apr. 1
Mineral Products Co.	Pfd. "A"	$.20 qr.	Mar. 30	Apr. 1
Newago Portland Cement	Preferred	$1.75 qr.	Mar. 26	Mar. 31
New York Trap Rock	Preferred	$1.75 qr.	Mar. 20	Apr. 2
Peerless Cement	Preferred	$1.75 qr.	Mar. 20	Mar. 31
Pennsylvania Salt	Common	$1.25 qr.	Mar. 30	Apr. 15
Santa Cruz Portland Cement		$1.00 qr.	Mar. 24	Apr. 1
Sterling Salt	Common	$.50 qr.	Mar. 24	Apr. 1
Superior Portland Cement	Class A	$.27½M.	Mar. 18	Apr. 1
United States Gypsum	Preferred	$1.75 qr.	Mar. 15	Mar. 31
United States Gypsum	Common	$.40 qr.	Mar. 14	Apr. 1
Warner Co.	1st Pfd.	$1.75 qr.	Mar. 14	Apr. 1
Warner Co.	Common	$.50 qr.	Mar. 30	Apr. 15
Worcester Salt Co.	Common	1¼% qr.	Mar. 24	Mar. 29

Sales of the company, an index to large building activity, would indicate an upward movement in the construction industry, President A. E. Dickinson announces. Total sales for the month of January were $942,438.29.

"This is an increase of $30,031.44 over that month a year ago, and is likewise an increase of $49,522.61 over December, 1929," President Dickinson declared. "With many big projects planned and others under way, it is reasonable to expect a good year in the construction industry," he added.

B. M. Pettit was elected vice-president and the other officers were all re-elected.

General Asphalt Earns Higher Rate During 1929

General Asphalt's annual report which has just been received confirms this department's estimates regarding the second half of the year from an earnings standpoint.

Although only $461,760 or $1.41 a share on the common stock then outstanding was reported for the first six months of 1929, still the full year's report bears out the expectations that the second half of the year is usually the best and a substantial improvement in net profit was shown.

General Asphalt and subsidiaries for the year ended December 31, 1929, report net income of $1,757,095 after depreciation, interest, federal taxes, etc.; equivalent, after 5 per cent preferred dividends, to $3.65 a share on 413,333 shares of no-par common stock. This compares with $920,506, or $2.78 a share on 210,577 common shares in 1928.

During the past year the bonds and preferred stock of General Asphalt Co. have been converted and retired, leaving the 413,333 shares of common stock outstanding as the only capital liability.

The conversion and retirement of the bonds and preferred stock paved the way for dividends on the common stock which have been started at a $4 annual rate.

Allotment was also made at $50 on the basis of one new common share for each three shares of common stock and the funds thus obtained provided for the redemption of such bonds as were not converted into stock.

Consumers Company Net Increased, Report Says

Consumers Co. for the year ended December 31, 1929, reports net profit of $853,035 after interest, depreciation, depletion, federal taxes, etc., equivalent after dividends on 6 per cent and 7 per cent preferred stocks, to 28 cents a share (par $5) on 733,110 shares of common stock. This compares with $587,964, or one cent a share on 652,535 common shares outstanding in 1928.

"At the present time any improvement on the operating results or 1930 depends on the number of economies which can be made in the operations of the new properties acquired through unified operations, and the savings in distribution costs, through shorter cartage hauls," according to Stuyvesant Peabody, president of Consumers Co., in his remarks to stockholders, accompanying the annual report. "It will be appreciated that acquisition of these properties was affected at a date after the peak of their business in the year 1929, which earnings are not reflected in this statement."

"As of June 1, 1929, all of the assets, business and goodwill of the Wisconsin Lime and Cement Co. were acquired. As of October 1, 1929, all of the physical properties, inventories, business and goodwill of the Central Lime and Cement Co. and the A. C. O'Laughlin were acquired.

"During the year negotiations were completed for the sale of approximately 700 acres on the west of our Dune Park property to the National Steel Corp. and approximately 200 acres on the east end to the Indiana Industrial Land Co. for approximately $1,200,000. The proceeds from sale of this land will be applied to the retirement of $1,000,000 par value Consumers Co. 6 per cent sinking fund bonds, series 'A' due January 1, 1946, and the balance to current assets."

The consolidated income account of Consumers Co. and subsidiaries for 1929 compares as follows:

	1929	1928	1927
Total sales	$23,146,617	$18,394,211	$19,620,473
Income	37,732,812	2,926,309	3,281,894
Expenses	1,556,833	1,362,718	1,254,180
Depreciation and depletion	709,463	488,694	458,783
Interest	521,481	377,066	510,000
Other interest	.....	54,042	11,947
Amortization bond discount	.....	23,825	40,353
Federal taxes	92,000	32,000	101,253
Net income	$ 853,034	$ 587,964	$ 905,378

Production of Sulphur Reaches New High Level

Production, shipments, and exports of sulphur reached new high levels in 1929, according to the U. S. Bureau of Mines, Department of Commerce. Sulphur production amounted to 2,362,389 long tons in 1929, compared with 1,981,873 tons in 1928, and 2,111,618 tons in 1927, the previous record year. Shipments totaled 2,437,238 tons, valued at about $43,800,000, compared with 2,082,924 tons, valued at about $37,500,000, in 1928, the previous record year. In 1929 production was continued as in previous years at Gulf, Matagorda County, by the Texas Gulf Sulphur Co.; at Bryan and Hoskins Mounds, Freeport, Brazoria County, by the Freeport Sulphur Co.; at Benavides, Duval County, by Duval Texas Sulphur Co.; and at Wharton, Wharton County, by the Union Sulphur Co. A new operation on Boling Dome, at Newgulf, Wharton County, Texas, was started by the Texas Gulf Sulphur Co. during the latter part of March, 1929. No production or shipments of sulphur were made in Louisiana in 1929. The final shipments of sulphur from the stockpile at Sulphur, Calcasieu Parish, La., were made in 1928. Over 99.9 per cent of the country's production and shipments of sulphur came from Texas. The properties of the Humboldt Sulphur Co. at Sulphur, Humboldt County, Nevada, and of the Utah Sulphur Industries at Sulphurdale, Beaver County, Utah, were the only others that reported production and shipments of sulphur in 1929.

Stocks of sulphur on hand at the mines decreased nearly 100,000 tons, following a decrease of approximately 100,000 tons in 1928, and were about 1,900,000 tons on December 31.

The average quoted price for sulphur as reported by the trade journals was unchanged at $18 a ton f.o.b. mines throughout the year. Open prices are $1 to $3 a ton higher and prices for sulphur exported are given as $22 a ton f.a.s. Atlantic ports.

Exports of sulphur or brimstone from the United States totaled 855,183 tons, valued at $17,628,813, compared with 685,051 tons, valued at $14,345,075, in 1928, and 789,274 tons, valued at $16,254,227, in 1927, the previous record year. Of the total in 1929, 200,012 tons was exported to Canada, 169,474 tons to Germany, 136,732 tons to France, 104,538 tons to Australia, 50,707 tons to Netherlands, 43,856 tons to the United Kingdom, and 37,048 tons to New Zealand. Exports of refined, sublimed, and flowers of sulphur decreased from 44,536,508 pounds, valued at $706,766 in 1928, to 39,564,975 pounds, valued at $649,240, in 1929.

Legal Information for Operators

Seller Bound by Oral Agreement of Salesmen

Generally speaking, a manufacturer or seller is not obligated by oral agreements made by his salesmen, particularly if the purchaser signs a written contract or order.

In other words, the sole implied authority of a salesman is soliciting orders and sending them to his employer for acceptance. Moreover, either the buyer or seller may cancel a written or a verbal order given by a purchaser to a seller's agent or representative, providing the cancellation is mailed before the salesman's employer accepts the order.

Another important established rule of the law is that a purchaser cannot change or vary the obligations expressed in a written contract by introducing testimony showing that the salesman or his employer made oral promises.

For illustration, in Portland Cement Co. vs. Whitmore Lumber Co., 150 S. E. 607, it was disclosed that a salesman, employed by a cement manufacturer, approached a prospective purchaser and obtained an order for two carloads of cement. The order was written and directed the cement company to ship 346 barrels (2 carloads) in cotton, including bags, at $2.76 per barrel, and charge to the purchaser, 10 cents per barrel discount for cash in 15 days from date of invoice or 30 days net. The order blank had printed thereon: "Orders are not binding on this company unless accepted by the general office." The order was signed by the purchaser.

The purchaser accepted and paid for the first carload, but refused to take delivery of the second car. The cement company filed suit and the purchaser attempted to avoid liability by proving that the cement salesman came to him and stated that he had sold two cars of cement to a contractor named Kaylor but, on account of company rules, it could not deal direct with Kaylor and that the salesman agreed that he would allow the purchaser 20 cents per barrel for unloading, hauling, storing and reloading the cement into Kaylor's trucks, and collecting the money for the same.

It seems that the salesman also stated that the purchaser need not pay for the cement until Kaylor had paid him. Kaylor accepted and paid for the first carload, but refused to take the second and the purchaser refused to accept it. The lower Court held the purchaser not liable, but the higher Court reversed the verdict, stating the following important law:

"The defendant company (purchaser) had notice from the order blank itself that the agent did not have authority to contract, but only to accept orders. But, even had he had such authority, the fact that the defendant (purchaser) has signed the written order, the law presumes that all preliminary negotiations were included and merged in the writing, if it purports to contain all of the contract, and parol evidence cannot be introduced to vary its terms. The order in the present case was clear on its face and contained no notation suggesting any other understanding than that contained therein."

Employee Was Within Scope of Employment

Ordinarily, an employee is not entitled to recover compensation for an injury sustained when he is not acting within the scope of the employment.

For instance, in Nagy vs. Kangesser, 168 N. E. 517, it was disclosed that a motor-truck driver was injured at 7:30 a. m. while driving the truck from his home to his employer's plant. The employee was not required to report for duty before 8 a. m., but his counsel argued that the employer was liable because he had in his possession the latter's automobile when the injury occurred. However, the Court held the employer not liable, and explained the established law in the following language:

"Inasmuch as the accident happened prior to 8 a. m., there could be no liability under the doctrine of master and servant, because the employee was not an employee in the performance of any duty in behalf of the master, unless it can be said that the employee is on his master's business while he is en route to his work to perform his duties. This position obviously is not tenable under the authorities, because the master cannot be held liable unless the act in question is part of an actual duty connected with employment. . . . To hold the master liable because of the possession of the automobile prior to 8 a. m. would not be based on merit or logic, because such a deduction and conclusion would hold the master liable under any other similar circumstances for any injurious act of the employee at any time between 5 p. m. and 8 a. m. of the succeeding day."

Manufacturer Not Liable for Personal Injuries

Generally speaking, manufacturers are not liable in damages to any injured person unless contractual relations existed between the manufacturer and the injured person at the time of the accident causing the injury.

For example, an employee, who was injured when operating a saw, sued the manufacturer and proved that the latter failed to provide the saw with a safety guard as required by the state statute.

However, since the injured person was employed by the purchaser of the saw and no relationship existed between the injured employee and the manufacturer the Court held the latter not liable and said:

"It is a general rule that manufacturers are not liable for personal injuries sustained through the use of their product by persons with whom they have no contractual relations. . . . The fact that the guard was not in place at the time that the machine was sold does not render the company liable."

If Contractor Accepts Another's Machinery

Usually, any person who wrongfully converts or takes possession of another's property is liable for a reasonable amount of damages, or the actual value of the property.

For illustration, in Sanford v. Good Roads Machinery Co., 124 So. 880, a subcontractor purchased a new cement mixer paying $225. The seller retained title to the machine to secure the balance due amounting to $1,500. Later the subcontractor defaulted in completing a contract and the principal contractor used the machine. The seller sued the principal contractor for full value of the mixer on the grounds that he had illegally taken possession of it.

However, the Court decided that $500 was a reasonable amount, considering its use by the subcontractor and also that the latter had paid $225 when he purchased it.

Insurance Problems Discussed

Windstorm Insurance

Windstorm insurance is more important in the field of the non-metallic industries than in other lines of production. In addition to the general risks of loss which were pointed out in our last issue, we are unfortunate in the seasonal nature of our work.

The heavy wind season in the United States extends from March through June. Although the records show tornadoes in every month of the year, heavy winds are much more frequent and do much more damage in the spring and early summer than at any other time. Now on account of the nature of our business, a property loss of any sort in the spring is more serious than at any other season. Many of our plants are comparatively idle in the late fall and winter. Spring and summer are the time when we earn practically all of the year's profits. If wind should wreck one of our buildings in November, for example, probably it could be rebuilt without much loss of business. But if the same damage should occur in April or May, and three months or more were needed to reconstruct the property, the loss would be serious. Not only would we be unable to complete our current orders and contracts, but some of our customers would probably go over to competitors and their good will would be permanently lost.

How Much Insurance?

Granted that due to the seasonal nature of our work, windstorm insurance is especially important in our industries, we face the practical question of what kind of a policy to carry. Broadly speaking, we should recommend first of all that you place windstorm coverage in the same company that carries your fire insurance. All fire insurance companies also write the windstorm policy, and if you are "sold" on a certain concern for one risk, that is probably the best for you for a new risk. If your fire insurance is divided among two or more companies, the wind coverage should be divided in exactly the same proportions. There are some borderline cases of combined wind and fire loss, and if your protection is concentrated in the same companies there can be no dispute or law suit as to which is to pay the loss.

Whether the wind risk is insured under a separate policy or added to a fire policy by endorsement is unimportant. The office practice of different companies varies in this respect, but as long as your coverage is in the same concern it does not matter whether they use one or more policies.

Total Loss Possible

There is no reason why a property owner should not carry as much wind insurance as fire. Disregarding the building foundations (which are frequently eliminated from fire policies also), your building and contents can be totally destroyed by wind. In our previous article we pointed out that substantial brick buildings could be completely wrecked either by a compressed air explosion immediately following a heavy wind or could be burned to the ground in a fire which was started through initial wind damage (in which case the fire policy would be void and would not cover the loss). Therefore we can think of no logical reason for buying wind insurance except in an amount exactly equal to the fire insurance on both buildings and their contents (machinery, furniture, etc.).

We must concede, unfortunately, that many property owners do carry less wind coverage than fire. Where the average amount of fire insurance on commercial property will probably run between eighty and ninety per cent of the full physical value (meaning cost of replacement minus actual wear and tear), we doubt whether the average amount of windstorm insurance will run much over sixty per cent of value. There is only one reason for this difference—ignorance. This is not so much ignorance on the part of property owners and manufacturers, however, because they understand the risk readily enough when they put some thought on it. The fault lies to a large extent with a large proportion of the insurance agents who have not made a technical study of the subject and therefore have not impressed their clients with the true picture. However, this situation is fast changing, and it is conservative to state that most progressive business men now carry full coverage against wind damage.

Rating Method

The rating methods in wind insurance are simple. There is no elaborately detailed schedule for little hazards and defects such as there is for fire insurance. Rates vary in different parts of the country, naturally, because the risk is greater in some states than in others, but almost everywhere the rates are considerably less than the fire insurance rates. In each state a basic rate is assigned to each of several broad classes of property, such as dwellings, fireproof buildings, ordinary brick and frame commercial buildings, and especially exposed structures like water tanks and loading cranes.

Except in the case of dwellings, it is usual to add a coinsurance clause to the wind policy. This stipulates that the insured agrees to carry insurance at least equal to a certain percentage of the value of his property. For wind insurance it is most common to name either fifty or eighty per cent as the guaranteed amount. The insured, of course, collects one hundred cents on the dollar in any loss as long as the amount of his insurance is up to standard. Putting the coinsurance clause on a policy allows a very substantial reduction in rate, and this practice is consequently almost universal in insuring commercial property because it gives the insured more coverage for less money.

Windstorm policies are usually written for a term of three or five years instead of for one year, because reductions in rate of one-sixth and one-fifth, respectively, are allowed for the longer terms.

Hail Damage

The basic windstorm policy does not cover damage done by hail. This damage may be covered for a small extra premium by attaching a rider to the standard policy. It is best for the insurance companies to keep these two risks separate in this way, because the hail risk is not uniform for all property. There are some buildings where hail could do little damage—possibly knock out a couple of windows, or something like that—and the building owner would rather carry his own risk of this loss than pay a regular insurance premium. Buildings which have an unusually large number of windows, of course, would want the extra hail protection. There is another large class which should have the hail insurance. Ordinary composition roofs are sometimes badly cut by hail stones, and owners of such roofs often find it to their advantage to insure this risk.

Review of Foreign Practice

Norway's Cement Trade More Active Last Year

The cement trade in the interior of Norway was larger during 1928 than in any of the years following 1923, on account of large use of this material in many new factories in Telemark and Vestland. Importation of cement into Norway increased from 16,000 metric tons in 1927 to 24,600 tons in 1928; exports at the same time grew from 148,857 to 160,300 tons, the principal export markets for Norwegian cement being the northern and western countries of Latin-America. The Norwegian producers have opened a joint sales office at Oslo under the direction of M. Holter, manager of the Dalen Portland Cementfabrik, for the purpose of facilitating the distribution of exports among the different foreign markets.—*Revue des Materiaux de Construction* (Paris), No. 241, p. 394, Oct. 1929.

Recovery of Kiln-Dust in Belgian Cement Plant

Interesting technical data on the operation of an electrical precipitation system for removing dust from cement kiln gases at the Chercq cement plant of the Societe Louis Delwart et fils, Tournai, Belgium, are given in the second section of *Annales de Mines de Belgique* for 1928 (Vol. 29), which was published a short time ago. This is a dry-process plant with two kilns producing 125 tons (metric) of clinker each per 24 hours. The kiln feed is previously "decarbonated" in vertical kilns, and then pulverized, and is extremely light, and only the addition of 8 per cent of water before entering the kilns prevents the escape of an extremely high percentage of the material along with the gases.

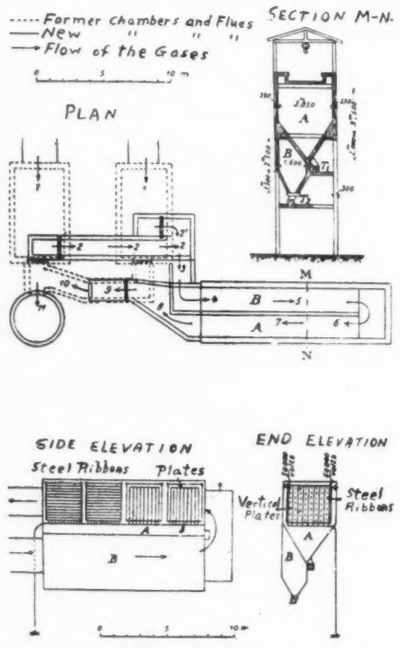
Originally the provision for recovering the dust that actually is carried away with the gases consisted of settling chambers with hopper bottoms, which settled out about four tons of dust every 24 hours. This was far from satisfactory, so that the management installed an electric filter or precipitation system made by the Oski company of Zurich. This system is based on the principle that particles of materials passing in the vicinity of conductors charged with electricity at high voltage are electrified and are precipitated on nearby objects connected with the ground. In the installation, the conductors (positive electrodes) are formed by steel ribbons of 20 by 1 mm. (0.8 by 0.04 in.) section stretched over a rigid metallic frame which is suspended by means of insulators in a concrete chamber forming part of the circuit followed by the gases. The ribbons are arranged in a series of vertical planes in the direction of the current of gases, and between the planes so formed are mounted rows of vertical plates 3.75 m. long and 0.25 m. wide (148 in. by 10 in.), constituting the negative electrodes. The ribbons are charged at 50,000 volts, while the plates are grounded.

The installation at the Chercq plant consists of four frames of the type described, placed one after the other in a concrete passage marked "A" in the sketch. In the bottom of this chamber is a series of hoppers discharging to a screw conveyor T_1. Under this passage is an ordinary settling chamber "B" in which the coarser particles are settled out before entering the filter chamber. This chamber B is likewise equipped with a screw conveyor (T_2). The screw conveyors return the dust to the same bins which store the materials that have been decarbonated.

The installation was planned on the assumption that gases would enter the filter chamber at 250 deg. C. As the gas leaves the kilns at 430 deg., this assumed a cooling by the injection of finely divided water in the conduit at the entrance of chamber B. By this means the gases were effectively cooled, but the moistened dust quickly formed blocks of hardened cement, so that the cooling had to be given up, and gases enter the filter at 370 deg. This means that a greater volume of gas has to be handled than was intended (around 1.645 m^3/min. instead of 1.340m^3/min.), and that the precipitating ability of the filter is lowered, as the efficiency decreases with the increase in temperature. By proportioning the dimensions of the filter to the volume and temperature of the gas it has been possible to purify practically completely gases from the roasting of pyrite at 500 deg. C. but in this case enlargement of the filter was impossible because of the dimensions of the concrete chamber.

The duct actually recovered is about 10,800 kg. (23,760 lb.) per 24 hours for the filter and the settling chamber B, and 4,000 kg. (8,800 lb.) for the old settling chambers. The gas at the entrance to the filter contains 4.15 grams of dust per cubic meter and is reduced to 0.493, a purification of 88 per cent on the assumption of equal volume, which of course is not quite exact on account of cooling during passage through the filter chamber. The power consumption is at the maximum about 2.42 kw.

The value of the dust recovered is



Electrical precipitation system at Cherq plant.

figured at 40 francs per ton, which for a 300-day year at 10.8 tons per day would give 129,600 francs. The cost of the installation was 600,000 francs; deducting seven per cent interest on this amount (42,000 fr.) leaves a profit of 87,600 fr. on the dust recovered; this would allow for depreciating the installation in 600,000/87,600, or roughly, seven years, without figuring the interest on the sums depreciated, nor the low consumption of power.

Newer Crystaline Form of Tricalcium Aluminate

In an investigation of the resistance of portland cement to sulphate action a new form of hydrated tricalcium aluminate, with six molecules of water, was prepared by treating pure tricalcium aluminate with steam under pressure and drying the product over quicklime. This hydrate is crystalline and isotropic. It is stable at 100 deg. C., but at 275-300 deg. C. it gives up three-quarters of its water, forming a stable 1.5-hydrate. Some water is retained up to 1,000 deg. C. Before the last of the water is expelled decomposition of the aluminate takes place. Recombination occurs at 1,000-1,100 deg. C. Further studies on the isometric form of hydrated tricalcium aluminate include methods of preparation, crystalline forms, x-ray diffraction pattern, and determinations of solubility and density. The products formed when the hexagonal form of hydrated form of hydrated tricalcium aluminate is dehydrated at definite vapor pressures of water at 21 deg. C. were studied, and the density, refractive indices, heats of solution in $HCl.200H_2O$, and the X-ray diffraction patterns of several probable hydrates were determined. The experimental evidence given indicates that hydrates of $3CaO.Al_2O_3$ having 6, 8, 9½ and 12 moles of water are formed, but that the water in excess of 8 moles is very loosely held and that its removal does not materially affect the crystal structure. The exact composition of some of the higher hydrates requires confirmation.—Thorbergur Thorvaldson and Norman S. Grace (University of Saskatchewan) in *Canadian Journal of Research*, Ottawa, 1:36-47 and 1:201-213, May and September, 1929.

German Potash Output Continues to Increase

Production of potash in Germany reached a record in 1928, according to statistics recently published by the *Statistische Reichsamt*, the output passing that of 1925, which was the highest previous year in the post-war period, and even that of 1913, although figures for that year include the production of the Alsation mines. As compared with 1913 the increase was 7.6 per cent in potash salts and 27.6 per cent calculated in pure potash (K_2O); the increase as compared with 1925 was 3.7 per cent in potash salts and 7.6 per cent in K_2O; as compared with 1927 it was 12.8 per cent in salts and 11.4 per cent in K_2O. The 1928 output amounted to 12,490,000 metric tons (all German statistics on potash are figured in *Doppelzentner* of 100 kg. but are converted to metric tons here for greater convenience), with 1,690,000 tons of K_2O. Out of the raw salts were produced commercial products amounting to 4,847,000 tons with 1,430,000 tons K_2O, as against 4,371,000 tons with 1,261,000 tons K_2O in 1927. The ratio of the manufactured products total production was 82 per cent as against 81 per cent in 1927 and 58 per cent for the last year before the war. The number of plants contributing to the total production increased by one to a total of 229, but the monthly average of shafts in operation amounted to only 60. The average capacity has increased about threefold since the inauguration of the "rationalization process" (Jan. 1, 1927), as compared with 1913. Sales of potash products in 1928 were 4,757,000 tons, with 1,421,000 tons of pure potash—increases of 11.3 per cent and 14.7 per cent, respectively, as compared with the preceding year.—*Kali, Erz und Kohle* (Berlin), 26:195, Oct. 1, 1929.

Production of Cement in Poland is Higher

At the beginning of the World War the Polish cement plants were producing 665,000 tons of cement annually, representing a 55 per cent utilization of an annual capacity of 1,300,000 tons. During the war, the Polish plants, situated at that time in Russia and in Germany, were forced to cease operation entirely, and those in Austrian Poland were cut to about 30 per cent of their pre-war production. After the war the plants were in large part in a state of demolition, and were faced with a condition of complete stagnation in the building industries. The plants in the province of Galicia formed an "Associated Cement Plant Bureau" at Krakow and refused to enter into any agreement with the plants in other parts of Poland. The plants situated in the former Russian province formed at Warsaw the "Union of Portland Cement Plants." After a prolonged competitive struggle, all of the plants in the country finally formed, in 1926, a "Centro-Cement" (central-sales office), which at present possesses a monopoly on all sales in the interior of the country. The production of cement mounted after the war to a production of about 800,000 tons in 1927, which was about 1.2 per cent of the world output. Exports that year amounted to 142,971 tons, and the consumption per person of the total population was 21 kg., as against 20 kg. in 1913.—*Revue des Materiaux de Construction* (Paris), No. 241, pp. 396-8, Oct. 1929.

Recent Developments in the Japanese Portland Cement Industry*

By MITZUZO FUJII
Technical Director, Asano Portland Cement Co.

The beginning of the Japanese cement industry was the erection of a small plant at Fukagawa in 1870 by the Ministry of Industry (later sold to the Asano Cement Co.), which began operations with a production of 40 to 50 bbl. a day. By 1928 the industry had grown to a yearly production of 22,474,500 bbl., and even in 1927 Japan stood fourth among cement-producing nations with an output of 20,752,000 bbl., which represented 92.5 per cent of the capacity of the Japanese mills. Nevertheless the per capita use of cement in Japan is still very small (0.3 per cent) and the prospects for future development of the industry are highly favorable.

The raw materials for cement manufacture in Japan are almost exclusively hard limestone and shale clay. Seven plants use a white pure crystalline limestone from Archaic rock formations; eight use a pure limestone of the Chichibu palaeozoic formation; two in southern Japan use limestone of mesozoic formation; one wet-process mill uses a marl deposit of tertiary origin on the Japan Sea; one uses a coral limestone from the quarternary formation, and two use a pure limestone of rather rare occurrence along with the dolomites of the Ordovician to Carboniferous formations. The most suitable and most widely used argillaceous material is a shale clay of tertiary origin; in southern and western Japan where such deposits are rare the most common material is a clay slate of palaeozoic and mesozoic origin. Japanese cement mills are also distinguished from those of other countries through the use of a large amount of ganister to increase the silica content.

Coals in the palaeozoic and mesozoic formations are rare and com-

* Digest of Paper No. 132 at World Engineering Congress, Tokyo.

mercially unimportant, but large deposits of tertiary coal are found widely distributed from Sachalin to Formosa. A great difference from the European coals in the Carboniferous formation is that the coals in the lower tertiary are bituminous and have the best properties. Korea has a locally developed coal field with anthracite predominating, that can be used for cement burning.

Mills and Equipment

In October, 1928, there were in operation thirty cement mills belonging to fifteen companies, members of the Japanese Cement Alliance, with a capitalization of 191,670,350 yen and a normal monthly capacity of 2,153,800 bbl. The equipment of these plants is summarized in the following figures:

I Drying equipment

	Clay	Limestone	Coal
Rotary dryers	61	11	49

II Crushing and raw grinding

(a) Primary crushers

	Limestone	Clay
(1) Gyratories	34	1
(2) Jaw crushers	23	9
(3) Hammer crushers	3	12
(4) Crushing rolls	9	30
(5) Other	7	5
Totals	76	57

(b) Secondary

(1) Fine rolls	17
(2) Ball mills	17
(3) Other	5
Total	39

(c) Fine grinding

(1) Ball and tube mills	54
(2) Compound mills	39
(3) Fuller mills	18
(4) Other mills	31
Total	142
(5) Air separators	76

III Coal crushing and grinding

(a) Crushers

(1) Hammer mills	1
(2) Roll crushers	1
(3) Other	1
Total	3

(b) Pulverizers

(1) Ball and tube mills	13
(2) Fuller mills	31
(3) Compound mill	19
(4) Other	6
(5) Aero pulverizers	11
Totals	80
(6) Air separators	10

IV Clinker grinding

(a) Preliminary

(1) Ball mills	10
(2) Rolls	2
(3) Other	6
Total	18

(b) Finish grinding

(1) Ball and tube mills	34
(2) Compound mills	58
(3) Other	4
Total	96
(4) Air separators	69
(5) Other separating devices	3

V Bagging machines

(1) Bates baggers	30
(2) Other	4
Total	34

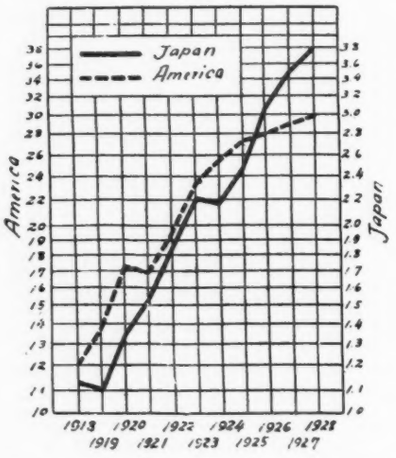
VI Rotary kilns

Length	Dry process	Wet process
0-20 meters	3	
20-30 meters	5	
30-40 meters	33	
40-50 meters	12	1
50-60 meters	5	
60 meters and over	19	3
Totals	77	4

The thirty mills, in addition, used on October, 1928, 53 waste heat boilers with total heating surface of 36,041 sq. m., and 32 turbo-generator of 69,830 kw. total capacity. The number of workers at the same time was 11,380 males and 917 females.

Cement Strengths

Since the establishment of the first specification for cement by the ministry of Agriculture and Commerce in 1905 the minimum requirements for portland cement have three times been revised. The present specifications require a specific weight of 3.05; fineness of 83 per cent through the 4,900-mesh per sq. cm. screen (about 175-mesh); tensile strength (1:3) of 14 kg/cm² at seven days and 21 kg/cm² at 28 days; compressive strength (1:3) of 210 kg/cm² at 28 days; and allows 4 per cent loss on ignition, 3 per cent MgO and 2 per cent SO_3. These strength tests are based on 1:3 mortars with standard "Soma" sand, which gives mortar strengths slightly higher than the German standard sand and only slightly less than the American.



Production of cement in Japan and America—millions of tons.

Japan has no public cement testing bureau, but comparative tests by members of the Technical Union of Japanese Portland Cement Manufacturers are available, showing that Japanese normal cements in general are distinguished from those of other lands by relatively high silica and low alumina content high index of activity) and by high strength figures.

Under the influence of the high-test special cements that began in Europe about 1924, the quality of Japanese cements has in the past few years been greatly improved through exact determination of the raw mix, intensive preparation and exceedingly fine raw grinding (about 2 per cent retained on the 4,900-mesh sieve). Efforts to standardize specifications for high-test cements have not been successful. The fact that ordinary commercial strength has reached strengths twice as great as the standard specifications caused the Technical Union of Japanese Portland Cement Manufacturers to propose a new standard specification of 12 per cent allowance on the 4,900-mesh screen, tensile strength (1:3) of 15 kg/cm² at three days, 20 at seven days and 25 at 28 days, and compressive strength (1:3) of 150 kg/cm² at three days, 220 at seven, and 300 at 28 days.

Organization

There are three scientific and commercial organizations of the industry: the Technical Union of Japanese Portland Cement Manufacturers; the Japanese Portland Cement Association, whose principal function is promotional, and the Japanese Cement Alliance, which is a cartel organization.

Fluctuations in the seasonal demand are not so severe as in America and Europe, due to the favorable weather on the east coast of Japan, where most cement is used. During the last four years the monthly percentage of the year's consumption fluctuated only between 6.5 per cent for the lowest month and 9.5 per cent for the highest month, as contrasted with 3 to 12 per cent in Germany and 4 to 11.5 per cent in America (six-year average).

Baltimore Office Moved to Different Location

The Electric Machinery Manufacturing Co., of Minneapolis, Minn., has announced the new location of its Baltimore office. Formerly at 432 North Calvert St., the Baltimore office is now located at 600 North Calvert St.

Lloyd R. Wilson, formerly with the Lakewood Engineering Co., Cleveland, is now associated with the C. O. Bartlett & Snow Co., Cleveland, as manager of sales of Bartlett-Snow truck bodies for transporting ready-mixed concrete.

Traffic News and Comment

Feldspar

Southern Freight Association proposal No. 49,372 involves rates on feldspar from North Carolina shipping points and Johnson City, Tenn., to eastern destinations. The basis proposed from various North Carolina shipping points is that now in effect from Spruce Pine, N. C., and other points in that vicinity on the C. C. & O. Ry. From Cranberry, N. C., the suggested rates are in relation to the present rates from Spruce Pine and other cross-country stations. From Cranberry Gap and Minneapolis the suggested rates are 10 cents and 25 cents, respectively, over the rates proposed from Cranberry. The basis suggested from Johnson City, Tenn., is to harmonize with other rates and prevent violations of the Fourth Section of the Act to regulate commerce.

Aggregates

A carrier's proposal is embodied in S. F. A. Docket No. 49406 relating to commodity description between southern points. The suggested description is "Road aggregates and building material (not ground, pulverized or processed, other than washed) in bulk, viz., gravel, crushed stone (other than bituminous rock, bituminous asphalt rock, asphaltic stone, phosphate rock, gypsum or stone dust), slag, rubble stone, broken stone or chert; sand, common (not ground, pulverized or processed, other than washed) in bulk; in straight or mixed, C. L. min. wt. 90 per cent of the marked capacity of car; except when car is loaded to full visible capacity. actual weight will govern."

The term "in bulk" is applicable on commodities named that can be transported in open-top cars without risk of damage from the weather.

Silica Sand

S. F. A. proposal No. 49414 involves rates on silica sand, C. L., from Ottawa to various southern destinations. The proposed through rates are to Nashville, Tenn., $3.70; Atlanta, Ga., $4.50; Elberton, Ga., $4.65; and Macon, Ga., $4.65.

The proposed through rates per ton are with min. wt. of 90 per cent of marked capacity of car, except when car is loaded to full visible capacity, actual weight will apply on basis of lowest combination.

Talc

S. F. A. proposal No. 49421 involves revision of rates on talc, crude, C. L. from Vermont points and Madoc, Ont., to Memphis, Tenn. The proposed rates from Bethel, Chester, East Granville, Waterbury, and Johnson, Vt., is 81½ cents per cwt. It is proposed to cancel present rate from Madoc allowing class or combination rates to apply.

Sand and Gravel

Central Freight Association Docket No. 24192 proposes rates on sand (bank, river and for torpedo) and/or gravel, C. L. from Dickason, Ind., to various points in Illinois, for joint line hauls in lieu of present combinations.

The following are illustrative:

To	Proposed rate (Cents per net ton)
Decatur, via B. & O.....	76
Bloomington, via C. C. C. & St. L.	95
Urbana, via C. C. C. & St. L.	80
Cheneyville, via C. M., St. P. & P.	101
Gibson City, via I. C.....	92
Neoga, via I. C.....	92
Monticello, via I. Trac.....	98

The proposed rates are not the same via the different routes—for example, to Arcola, via I. C., 92c; and via Penna., $1.01.

From Montgomery, Ala., to destinations in Louisiana west of the Mississippi River, it is proposed in S. F. A. proposal No. 49446, to establish 8½ per cent of first class rate.

Shippers of sand and gravel located at Montgomery, Ala., have asked the carriers to establish a line of through rates to destinations in the State of Louisiana west of the Mississippi River to take the place of the present rates which are made on combination basis.

It is proposed to make the new commodity rates 8½ per cent of the first class rates. This is proposed in Southwestern Freight Bureau Docket No. 19665.

Trunk Line Association Docket No. 23259 relates to reduction sought, by a shipper of sand, from Cumberland, Md. Typical rates are as follows:

	Present rates	Proposed rates
To P. & L. E. stations, Glassport, Pa., to Brownsville, Pa.	$1.40	$1.30
To Monongahela R. R. station, Lemley, W. Va., to Brave, W. Va.	1.80	1.70
Randall, W. Va., to Fairmont, W. Va...	1.40	1.30

Silica Stone

From Salina, Okla., to points in Southwestern Freight Bureau territory, a mileage scale of rates on crude, lump or mine-run silica stone, C. L. is proposed in Southwestern Freight Bureau Docket No. 19651.

The proposed rates are for 5-mile blocks up to 100 miles, 10-mile blocks up to 240 miles, and 20-mile blocks up to 800 miles.

The following are illustrative:

Miles	Rate in Cents Single line	Joint line
5.....	3	4
50.....	6	7
100.....	8	9
150.....	9	10
200.....	10	11
260.....	12	13
300.....	13	13½
400.....	15	15½
500.....	17	17
600.....	18	18
700.....	20	20
800.....	22	22

For 500 miles and greater, the proposed basis for single and joint hauls is the same.

Soapstone and Talc

C. F. A. Docket No. 23507 proposes rates from Chatsworth, Canton, Carterville, and Jasper, Ga., and Kinsey, N. C., to points in C. F. A. territory on the basis now in effect from Marshall, N. C. The reasons advanced are that the proportional rates from Chatsworth and Marshall are the same to Cincinnati and Louisville.

Complaints Filed

Docket No. 23190, Northern Indiana Sand & Gravel Co.—Attacks rate of 75c from Wolcottville, Ind., to Chicago as unjust and unreasonable.

Docket No. 23009, Washington Building Lime Co.—Attacks method of computing and applying scale basis of rates on cement from Martinsburg, W. Va., on the one hand and Security and Union Bridge, Md., on the other, to Baltimore and other seaboard and eastern cities, resulting in disadvantageous and unreasonable rates.

Docket No. 23245, Industrial Silica Corporation—Attacks rates on sand and gravel from points in Ohio and Pennsylvania to eastern destinations.

Docket No. 23265, J. W. Moore Co. —Attacks rate on roofing slag from Swedeland, Pa., to Providence, R. I.

Docket No. 23009, Washington Building Lime Co.—Attacks rates on cement from Martinsburg, W. Va., to eastern cities.

Docket No. 23226, Ayers Mineral Co.—Attacks rates on sand from Zanesville and other Ohio points to destinations in Iowa, Missouri, Wisconsin, Ontario, Illinois, Indiana, Michigan, Kentucky, New York, Pennsylvania, and W. Virginia. Alleges Ottawa, Oregon and Wedron, Ill., preferred.

Cement

A shipper of cement located at Mitchell, Ind., has asked the carriers to publish lower rates to all stations on the E. & O. V. Ry. For some time a rate of 11.5c has been in effect to all stations on this line. A rate of 10.5c is sought to all stations, Kentucky Ave. (Evansville) to Kensington, and a rate of 9.5c to stations Richland Jct. to Richland. It has been stated that the rates sought are in line with the I. C. C. Docket No. 12710 scale. Central Freight Association Docket No. 24311.

Coated Stone

A shipper of crushed stone coated with oil, tar or asphaltum, located at Earnest, Pa., has asked the Penn. R. R. to establish rates based 10c per ton over the current crushed stone to various destinations on the Penn. R. R. It stated that the proposed rates are comparable with rates now in effect from Glen Mills, Birdsboro and Monocacy, Pa. Trunk Line Association Docket No. 23230 covers the subject.

Central Freight Association Docket No. 24291 covers an application filed by shippers of crushed stone or gravel, coated with oil, tar or asphaltum located at South Lebanon, O., for a new line of rates to destinations in West Virginia.

The following examples illustrate the rates sought:

B. & O. R. R. destinations	
Benwood	$2.34
Charleston	3.63
Clarksburg	3.28
Fairmont	3.28
Huntington	2.68
Kenova	2.68
Morgantown	3.28
Parkersburg	1.99
Wheeling	2.34
Penn. R. R. destinations	
Benwood	$2.34
Follansbee	2.22
New Cumberland	2.22
Warwood	2.34
Weirton	2.22
Wheeling	2.34
C. & O. Ry. destinations	
Barboursville	$2.50
Charleston	2.50
Kenova	2.50
So. Charleston	2.50
N. Y. C. (O. C. Lines)	
Charleston	$2.50
Gauley's Bridge	2.57
Point Pleasant	1.99
N. & W. Ry. destination	
Kenova	$2.50
Monongahela R. R. destination	
Fairmont	$2.50

Will Extend Scale

With a view of granting shippers commodity rates for distances up to 250 miles, the B. & M. is considering the extension of scales of rates which now run only to 200 miles.

In New England Freight Association Docket No. 19373, the following rates are proposed:

Sand and gravel for distances over 200 miles and not over 225 miles, $1.50 per ton; and for distances over 225 miles and not over 250 miles, $1.60 per ton.

Stone dust (except limestone), screened or crushed gravel, slag and stone, viz., granite, trap rock, quartz or sand stone, crushed or broken, including grout, rubble or chips (waste products of quarries) for distances over 200 miles and not over 225 miles, $1.60 per ton; and for distances over 225 miles and not over 250 miles, $1.70 per ton.

Crushed Stone

In Southern Freight Association Docket No. 49720 a shipper asks that commodity rates be established on crushed stone from Big Stone Gap and Glenita, Va., to stations on the Saltville and Abingdon branches of the N. & W. Ry.

The following are representative of the rates sought:

	From Big Stone Gap	From Glenita
To		
Litz, Va.	$1.15	$1.05
Plasterco, Va.	1.25	1.15
Watauga, Va.	1.15	1.05
Green Cove, Va.	1.25	1.15
Carters, N. C.	1.35	1.25
Brownwood, N. C.	1.40	1.35

Trunk Line Association Docket No. 23051 proposes rates from Lenhartsville and Trexler, Pa., to various destinations in Pennsylvania. The proposed rate to Reading of 75c from the former point and 80c from the latter point are illustrative.

The proposed rates are said to be comparable with others involving similar movements.

Ground Limestone

The Southern carriers in their Docket No. 49614 propose to cancel the present rates on limestone and/or marble ground or pulverized between all points south of the Ohio and Potomac Rivers.

In lieu of the present rates they propose to establish mileage scales substantially the same as prescribed by the I. C. C. in I. C. C. Docket No. 19943.

Crushed Marble

Southern Freight Association Docket No. 49649 contemplates cancellation of existing commodity rates on crushed marble and crushed stone from Knoxville, Tenn., Tate and Whitestone, Ga., and Gantts Quarry, Ala., to various destinations west of the Mississippi River in Louisiana, Arkansas and Oklahoma.

The cancellation of the present rates will put the rates on combination bases.

Consider New Rates

The carriers are considering the establishment of a new line of rates on sand, gravel, crushed stone, etc., from Gravel Siding and Old Ham, Miss., to various destinations in the state of Arkansas, including Little Rock, Hoxie, Pine Bluff, and McGehee.

The proposed rates are based on the joint line scale prescribed in I. C. C. Docket No. 17000, part II, observing as minima the joint line scale prescribed in Docket No. 17517, plus 6 cts per ton.

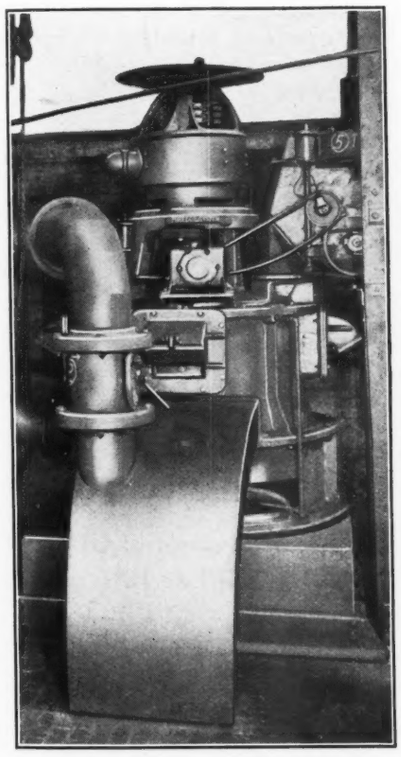
This subject is covered by Southern Freight Association Docket No. 49670.

New Machinery and Supplies

Coal Pulverizer Built with Magnetic Separator

A new type of coal pulverizer has just been designed by Aubrey J. Grindle, president of the Pulverized Fuel Equipment Co., division of the Rockford Drilling Machine Co., which is a subsidiary of the Borg-Warner Corp. This is to be known as the type B Purfeco unit. The company designs and furnishes pulverizers for small furnaces, domestic and industrial heating purposes in capacities as low as 6 lb. and as high as 5,000 lb. of coal per hour.

The pulverizer has a disc-and-plow-type feeder which extracts the tramp iron by a drum-type magnetic separator. The feeder consists of a revolving table which receives the coal. The plow scrapes the desired volume off the table to be fed into the top of the pulverizer.



New type coal pulverizer.

The pulverizer is of the vertical-shaft type with one stage of swing hammers about the fine grinding. The coal is held in liners in the form of circular pockets. Coarser particles of coal are held in these pockets by centrifugal force of the beaters, thus creating and combining impact and attrition action on the coal. A slight air current separates the fine dust and carries it to the discharge where it is blown through the burners to the furnace.

This is a complete firing unit requiring but one motor for feeding, pulverizing and furnishing combustion air. It is equipped with an exhauster of sufficient capacity to furnish all air for combustion. A graduated dial on the coal plow controls the feed. There are no belts or ratchets. There is no storage of pulverized coal hence there is no dust-collecting problem. The air inlet at the top of the mill may be closed to increase fineness of pulverization. Repairs are made through doors in housing without dismantling the unit.

Blow-down Boiler Meter Indicates Concentration

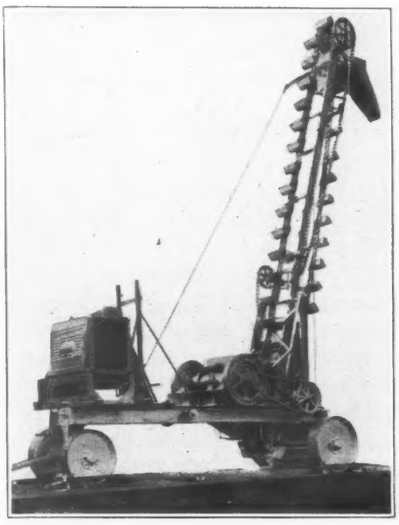
All doubt and uncertainty for maintaining boiler concentration is claimed to be overcome by the Elgin Concentrometer, the concentration or blow-down meter recently placed upon the market by the Elgin Softener Corp. This instrument shows boiler concentration at a glance, directly in grains per U. S. gallon. The Concentrometer consists of a combination thermometer and hydrometer, the thermometer having a graduated scale from 80 to 100 deg. F. The hydrometer scale, which reads directly in grains per U. S. gallon, is calibrated for every 10 grains and has a range from 0 to 500.

To use the Elgin Concentrometer, a sample is obtained from the water column line after blowing out all stagnant water, about a quart of water being blown into a metal container where it is allowed to cool. This water is then poured into the sample jar and the Concentrometer is lowered into it and allowed to find its own level. When the water sample has cooled to 90 deg. F., as shown by a thermometer, a scale is read at the level of the water in the sample jar. This shows the concentration in grains per U. S. gallon. As the equivalent concentration varies with temperature, the reading should be taken at 90 deg. F. It is then possible to compare all boiler waters and have them all upon the same basis of comparison. Blowing down immediately ceases to be a vague, uncertain operation. Instead it becomes an accurate, precision operation, chemically correct, yet simple and easy to carry out.

With the Elgin Concentrometer the condition of a boiler water may be determined in a few minutes. Even in the most scientifically operated plants it will be found that some boilers are being blown down often enough.

Crusher and Elevator are Mounted as Unit

An interesting operating unit consisting of a Cedar Rapids 336 reduction crusher, and a 25-ft. folding elevator mounted on a special I-beam truck has just been shipped to the Dexter Construction Co. at Dryden, Texas. An especially practical feature of this outfit is the 50-hp. Buda engine mounted on the same truck with crusher and elevator, making a compact piece of operating equipment for crushing 3-in. stone to as fine as ½ in. and elevating it into trucks.



Portable crusher-elevator unit.

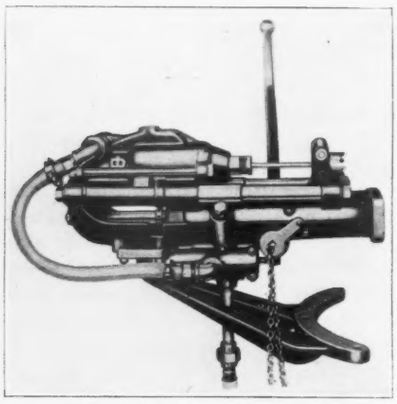
The Cedar Rapids crusher has a high output of fine crushed aggregate and low power consumption. Hyatt roller bearings are one of its interesting construction features.

This plant is one of the products of the Iowa Manufacturing Co. and was sold by the Steel Products Corp. at El Paso, Texas.

Shank-and-Bit Punch Fits Drill Sharpener

The Ingersoll-Rand Co., New York, N. Y., has produced a new shank-and-bit punch known as the 34SP punch. It is designed to fit the No. 34 drill steel sharpener.

The feed cylinder, valve-chest oiler, and guide holder are constructed in one piece, and the valve chest is bushed. The short throw and easy reach of the operating lever greatly speeds operations. Complete lubrication is maintained from one oil chamber.



New shank-and-bit punch.

Stuck pins are eliminated by the positive action, which drives the punching pin out of, as well as into, the steel which is held clamped in the sharpener during the operation. Combination shank and bit guides permit handling both bits and shanks on any one steel section without changing guides and assure the correct alignment of steel to be punched.

With a 34SP punch attached to the No. 34 sharpener, the complete outfit will handle any section of drill steel up to 1⅛ in. in diameter, and will make bits up to 2½ in. in diameter.

New Portable Kerosene Burner and Pump Tank

When welding heavy pieces of iron and steel with the oxy-acetylene torch it is usually necessary first to preheat the section. The preheating operation eliminates any strain with resulting warping or cracking that would otherwise occur if an attempted "cold" weld were made. It also gives a weld that is "soft" and easily machined. It also saves oxygen and acetylene. Good oxy-acetylene welding must therefore depend to a considerable extent on a kerosene preheating torch.

Portable torch and pump tank.

The St. Paul Welding and Mfg. Co., St. Paul, Minn., has for several years used a portable, hand pump outfit, which they have put on the market as the Torit 8-K. The torch throws a flame about 2 ft. long. The tank, of 10-gal. capacity, is equipped with a double-acting pump allowing for suction of either air or kerosene. Thus the tank can be refilled while the torch continues to operate. The outfit, being portable, allows for use inside or outside the shop and in any kind of weather.

Portable Tractor Hoist Provides Flexible Unit

Portability is one of the features of the new Trackson hoist which has recently been put on the market by the Trackson Co., Milwaukee, Wis. It is built for mounting on the McCormick-Deering tractor, providing an efficient, flexible unit which can be quickly driven from one job to another under its own power.

This equipment will be found convenient for operating drag-line and clamshell buckets, hoisting materials from pits, mines and quarries, spotting and unloading freight cars, pulling loaded trucks up steep inclines and through mud-holes and soft ground, hauling and skidding heavy machinery and materials, etc.

New tractor-mounted hoist.

The hoist was designed by J. E. Dale, who has been associated with the Trackson Co. for several years. It is built to give reliable, uninterrupted service and to stand up under the hardest usage.

Some of the features embodied in the hoist are improved screw-type clutches, oversized drum shafts and increased cable capacity, hand-lever control and ready adaptability from the single to a double-drum-type hoist. The auxiliary drum may be attached as the user needs it, without any alteration to the main drum unit. It is mounted directly over the main drum, making a complete, compact two-drum machine.

The hoist is built both in the portable model for tractor installation and as a stationary hoist. The latter has a material elevator spool which is adapted to endless cable work such as operating material elevator cages in construction jobs. The line speed is 290 ft. per min. in both high and reverse gears, and 130 ft. per min. in low. The elevator spool is readily interchangeable with the gypsy spool and can be installed quickly. The stationary hoist has a dog-type clutch, transferring the power from the main drum shaft to the elevator spool. The latter can be operated independently of the main drum. The brake is of extra-large capacity, insuring long wear to the brake lining and ample ability to hold the load.

Motors Redesigned to Give Higher Efficiency

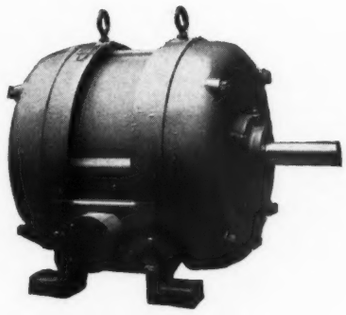
An interesting improvement has been made in the electric motors manufactured by The Cleveland Electric Motor Co., Cleveland, Ohio. It is stated that, through this improvement, fan-cooled semi-inclosed motors can be supplied in the same-sized frame and at the same price as those of the open type.

The ventilating system has been redesigned and still further improved; changes having been made in the construction of bearing brackets, fans, and end-rings (that is, the castings placed next to the laminations at each end of the stator). This re-design, however, was made without affecting the interchangeability of the essential

parts of the motor with those of previous design.

Even at low speeds, the new type of fan develops a steady pressure and volume of air, and very decidedly increases the cooling effect. Baffles placed on the bearing brackets direct the air around the stator windings, and thence through unrestricted passages out through the end-rings.

The end-rings are so designed that the air-current leaves the motor in a



New design of electric motor.

practically horizontal direction and sweeps over the outside face of the stator laminations—thus still further increasing the removal of heat from the machine. In addition to performing this important service of properly directing the air currents the end-rings are so constructed that the outside flanges are carried out some distance over the face of the laminations, thus preventing dirt from falling into the air passages. The construction is therefore essentially semi-enclosed. The new construction is now to be furnished as standard in squirrel cage and slip-ring motors, both of ball-bearing and sleeve bearing types, for general purpose, multispeed or elevator applications. In a modified form it is also used for fan-cooled totally enclosed motors.

In addition to these improvements, the electrical design has been modified so that these motors may be used on either two or three phase service without any of the magnetic hum produced by most commercial motors; and extensive tests have shown the ability of the new design to handle the most critical types of installation without difficulty.

Design Master Switch for Cranes and Hoists

A new master switch, the function of which is to regulate the control circuits of a magnetic contactor controller, and intended for use on cranes, hoists, ore bridges, steel-mill machinery, and other applications where full speed control is desired, is being built by The Electric Controller & Manufacturing Company, of Cleveland, Ohio.

Features of the master switch are the use of ball bearings, the short throw of the operating handle, the absence of gears, and the fact that the contact fingers always ride on uninterrupted plane surface.

Also contributing to the smooth and even operation, is an accurately machined, notched track, on which an improved roller-type centering device rides. This permits the operator to distinctly feel the various speed points, the notch in the "off" position, of course, being machined more deeply than the others.

Particular attention has also been given to make the width of the switch as small as possible, so that when several are mounted in a crane cage or operator's pulpit, the operator can, without moving his position, conveniently reach and operate them. Other outstanding features are the straight-line lever operation, the short throw of the handle and the fact that the switch can be mounted in the upright or the inverted position which permits a close grouping of a number of switches.

The switch is entirely enclosed by a heavy-gauge steel cover and is arranged for conduit connection. Both the contacts and contact fingers are of a greatly improved design and are easily renewable.

Fully-inclosed master switch.

New 6-Cylinder Truck is Air-Brake Equipped

The Series 100, a new straight-frame construction, air-brake equipped truck has just been announced by Relay Motors Corp. of Lima, Ohio. The unusually low frame height of this 5-ton truck results from the improved construction whereby the axle housing and spring pads are located below the wheel center.

The six-cylinder motor with 4⅜-in. bore and 4¾-in. stroke develops more than 100 hp. and has an S. A. E. horsepower rating of 45.9. A seven bearing crankshaft, forced feed oiling system with pressure feed to crank-shaft bearings, connecting rod bearings, cam-shaft bearing, overhead valve mechanism, automatic float feed-type carburetor are included in the specifications.

A multiple-disk clutch, Westinghouse air brakes and a transmission with five speeds forward and two speeds in reverse are other outstanding features.

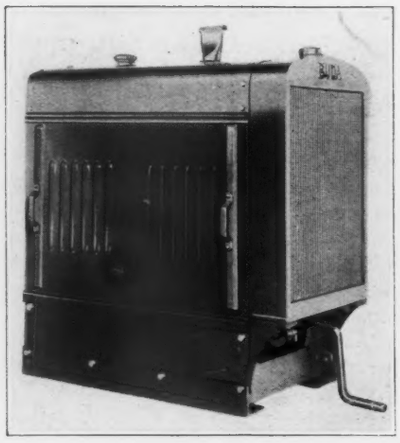
Compact, Light-weight Power Unit Announced

The Buda Co., Harvey, Ill., recently announced the model H-199 power unit. This unit is light in weight, unusually compact making it adaptable to a big variety of industrial installations. The overall dimensions are approximately 21 inches wide, 39 inches high, and 44 inches long. The power development ranges from 16 hp. at 800 r.p.m. to 45 hp. at 2000 r.p.m.

The engine is a 3¾ x 4½, four cylinder, with a piston displacement of 199 cu. in. The crank shaft is 3 in. in diam. on five main bearings and the shaft is short and close coupled.

The lubricating feature of this engine is the constant supply of a large quantity of oil at high velocity and uniform pressure. The cooling system is also very effective as there is no excess water jacketing about the cylinder bores, which insures the engine arriving at proper operating temperatures very rapidly. A large capacity water pump passes a large volume of water at high velocity through the engine at all times. The water pump is equipped with stainless steel shaft and leak-proof bearing.

The main bearings are the customary half shell, babbitt-lined type, but are shimless. The connecting rods are babbitt-lined directly to the steel forgings. The valve-tappet cluster assembly is worthy of special



Engine of compact design.

mention as it is made in two groups and designed for quick accessibility in service.

The crankcase and cylinders are of chrome nickel alloy iron. Provision is made for the use of fuel pump, oil filter and electric starting equipment when desired. The air cleaner is built in as a part of the engine.

A large capacity radiator is furnished which cools the engine under the most adverse conditions. The radiator is supported on a casting which also carries the front end of the engine. The fan is 18 in. in diameter with 4 blades and is driven from the crank shaft by a V belt.

New Shock Absorber for Vacuum, Pressure Gauges

A device designed to avoid the difficulty of getting correct pressure or vacuum gauge readings on pipe-lines containing liquid steam whose flow is pulsating, is announced by the Meriam Co., Cleveland, O.

This flow condition is often met where reciprocating pumps must be installed in lines where it is impracticable or too costly to install air-receivers. The same condition may also be met with in pumping service where considerable solid matter is carried in suspension, as in sand-pumps, digester tank pumps, etc.; because for such work the pump impeller blades must necessarily be comparatively few and widely spaced.

The device consists of a steel air-tight chamber in which is a long spiral coil of tubing having a small bore. The remainder of the interior of the chamber is hollow and acts as a small air receiver for the gauge mounted at the top. This spiral coil is connected to the pipe line at one end, the other end opening directly into the chamber. The pulsations in the pipe line are therefore largely dissipated by friction in passing through the long narrow bore of the tube. The small remaining amount of pulsation is absorbed by the cushioning effect of the air in the chamber itself. The gauge is connected to a vertical tube which has its opening inside the chamber close to the bottom. Pulsations and shocks therefore are eliminated, and thus the gauge reads only the average pressure instead of registering the usual "jumpy" effect which is so hard to determine accurately. The length of the coiled feed pipe is of course proportioned to suit the conditions of the pipe-line on which it is used.

Shock absorber for gauge.

Guarantee Exceeded on Improved Model Crusher

Williams Patent Crusher and Pulverizer Co. has perfected the Jumbo Jr. crusher. One of these, a No. 5, is installed in the plant of the Ohio Hydrate and Supply Co., Woodville, O., where it was guaranteed to reduce 25 tons of 14-in. and smaller lump lime per hr. to approximately ⅛-in. size. Actually its performance has proved its capacity amply sufficient to handle the feed from a 24-in. pan conveyor which moves 50 tons per hr. The operating company reports that, since this machine was installed, it was possible to eliminate one man in the grinding force.

Crusher taking feed from 24-in. pan conveyor.

Urges Self-Unloading Boats Replace Barges

A saving of 40 per cent in first cost and 20 per cent in operating costs in the river transportation of bulk materials such as coal, cement, sand and gravel and crushed stone can be made by replacing the barges and towboats now in use with self-propelled self-unloading boats handling an equal tonnage, according to Leathem D. Smith. A typical fleet of 48 barges can be replaced by two of these boats on a 200-mile river haul.

The above statements were made by Mr. Smith who is president of the Leathem D. Smith Dock Co., Sturgeon Bay, Wis., after a 10-day auto trip which took him from St. Louis down the Mississippi River and up the Ohio River. He found considerable interest evidenced in this method along the entire route. The above figures, according to Mr. Smith, are conservative as the additional hazard and cost of looking after the fleets of barges at the loading and unloading points was not taken into consideration.

A comparison of the two systems shows that they are almost exactly opposed to each other. The towboat and barge system depends on a large tonnage moving slowly and limited by the number of empty barges that the boat can push back upstream. Idle barges are left at the loading point during the towboat's absence and an equal number at the unloading point. This means that with a typical fleet of 48 barges only 16 will be in motion at one time.

Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

In Two Sections—Section Two

Published Bi-weekly on Wednesday for Producers and Manufacturers of Sand, Gravel, Stone, Cement, Gypsum, Lime and other Non-Metallic Minerals by

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to
March 26, 1930

INDEX TO VOLUMES XVIII AND XIX

It is the purpose of this index to make readily available only items to which readers of PIT AND QUARRY might wish to refer.

To this end, articles are cross-indexed as many ways as practicable; for example, the article "Cement and Gypsum Plant at Hanover, Montana, Operated by Three Forks Portland Cement Company", by Francis C. Lincoln, beginning on page 27 of the November 20, 1929, issue of PIT AND QUARRY, is indexed under the title of the article, under the author's name, under "Gypsum", under "Montana", and under the name of the company. As the title begins with the word "Cement" it is automatically indexed under this heading. Thus, if you know the title, the author, the name of the plant, or its products, you can readily locate the article.

This index is not intended to be a complete listing of all matter printed in the twenty-six issues comprising volumes XVIII and XIX of PIT AND QUARRY. Trade notes, patent reports, descriptions of new machinery, and some other miscellaneous and small items are not indexed.

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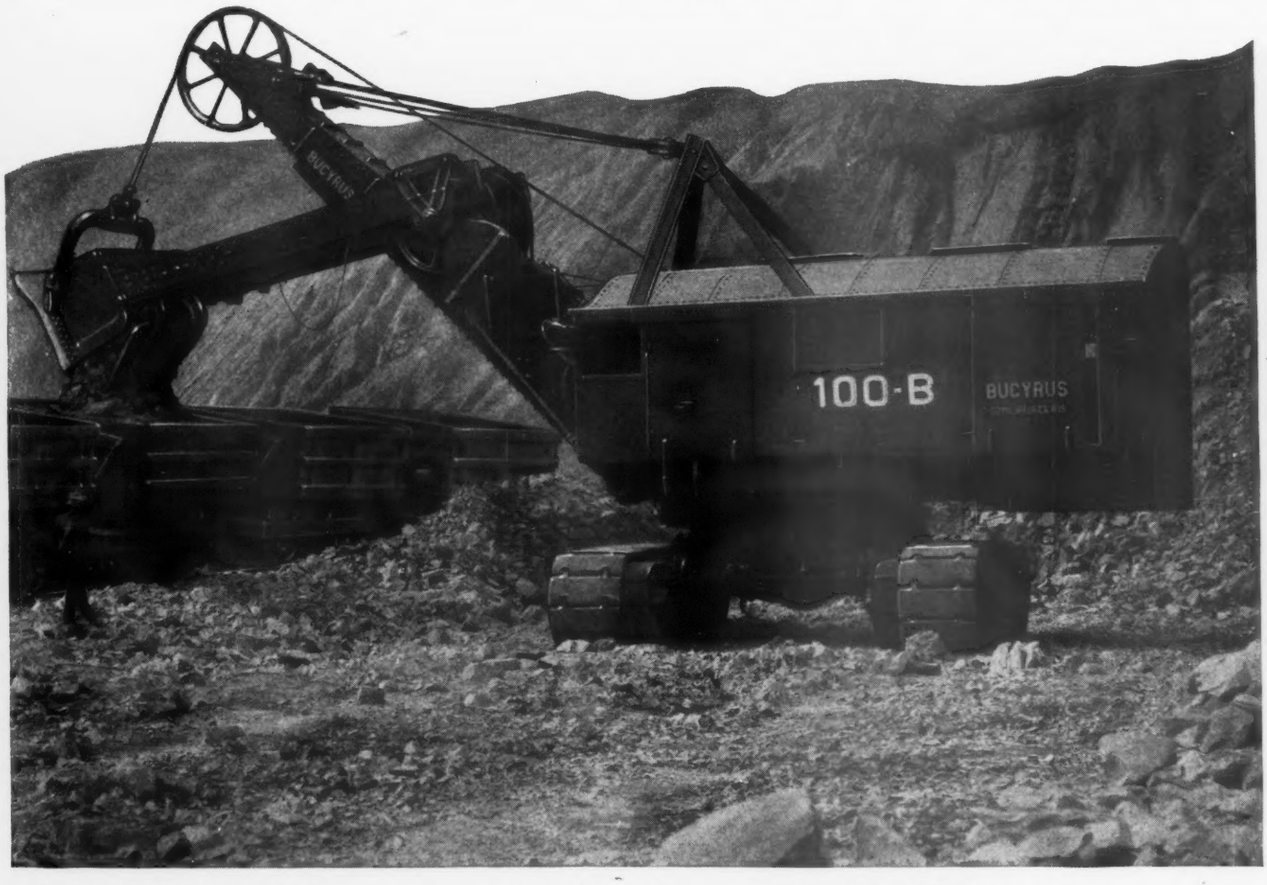

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